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August 1989
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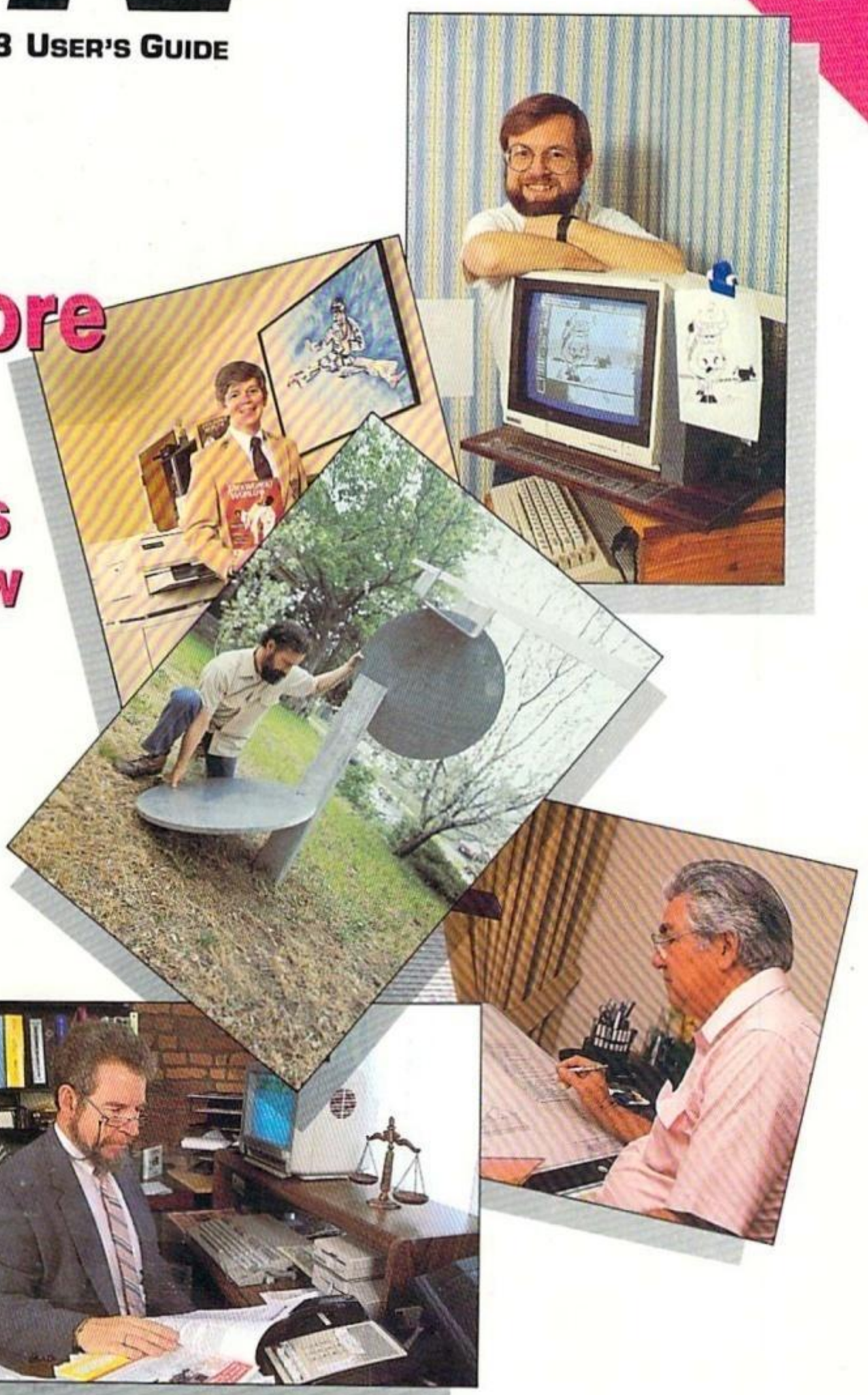

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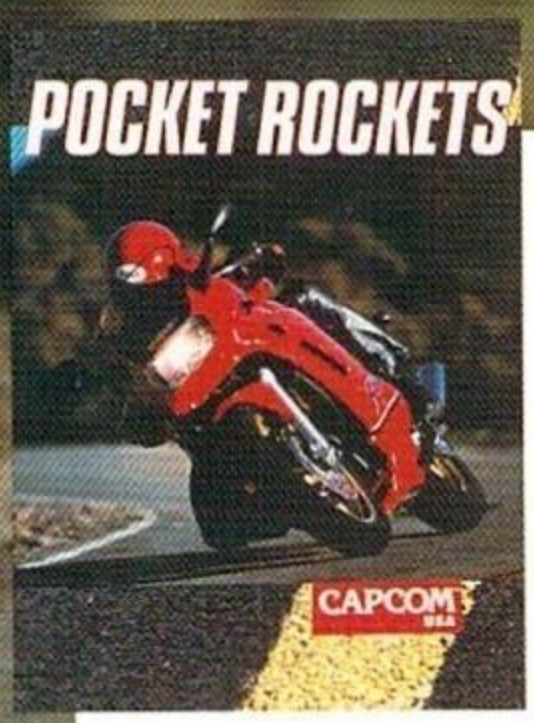

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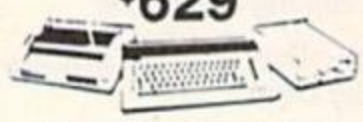

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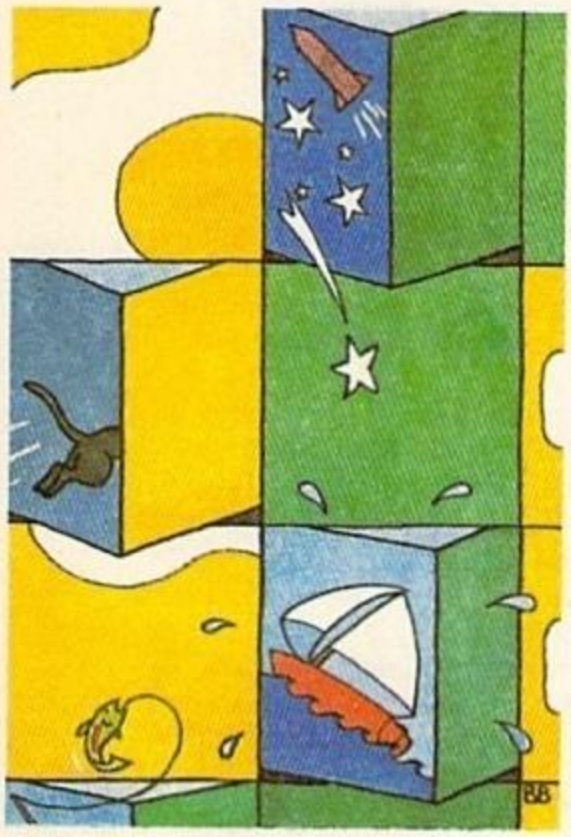

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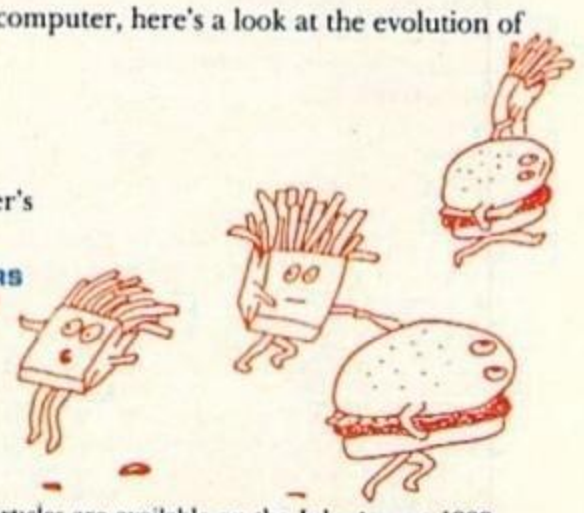

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* If you dread typing in programs, the listings for these articles are available on the July–August 1989 ReRUN disk for $16.47. To order, see page 37.

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RUNning Ruminations

"Have you ever heard of anyone getting attached to an IBM clone?"

I'm always amused and intrigued by the variety of uses computerists have devised for their Commodores. The applications are as numerous as chips in the computer market.

This month's profile of Commodore applications runs the gamut from helping to walk the dog at night to controlling the manufacture of printed circuit boards.

The typical *RUN* reader, who uses his Commodore for word processing, games, maintaining lists, or perhaps some Basic programming, will want to find out how his applications compare to those profiled in this issue.

Not many of us use the computer to the extent that "Slim" Johnson does. His C-128 waters the lawn around his Florida home and even turns his Christmas lights on and off.

But most of us can probably identify with Ohio lawyer Patrick West, an applications user who finds his computer as handy as a shirt pocket. He uses his computer for word processing and for maintaining records in his law practice.

Another interesting profile is that of Milo Dailey, editor of a martial arts publication, which used 64s to maintain its subscriber list before switching over to IBMs. Milo admits to having grown accustomed to the 64 over the years. He asks, "Many people are attached to their Commodores, but have you ever heard of anyone getting attached to an IBM clone?"

We doubt it, Milo. Creativity and determination are the hallmarks of the Commodore user community. The C-64 is the underdog, the one who enters the ring with no chance in the world to survive against the big boys. Like the famous cinematic pugilist, Rocky Balboa, the C-64 overcame insurmountable odds to dethrone the champ and capture the hearts of thousands of adoring fans.

Most of us became interested in Commodore computing because that machine was the best bargain. Let's face it. If money were no object, we might have purchased an IBM. Why, then, do we stick with Commodores?

Perhaps the answer lies in this month's Mail RUN letters, which provide some revealing insight into the character and needs of users. These are your comments on our Commodore service article that was featured in the May issue. Perhaps no other article since we explored the copy controversy question in January 1987 has elicited as much response.

Your comments prove that Commodore computing is more than an entertaining diversion. For some users, it is an integral part of their lives. For others, it is their livelihood. For most, it is a valuable activity to be defended when it faces threat or neglect.

These letters are testimony to the fact that you can love the product and yet be less than ecstatic about the company behind the product. The 64/128 offers the power and flexibility at a price users can afford. This, simply, is the reason for its success.

Dennis Brisson

Dennis Brisson
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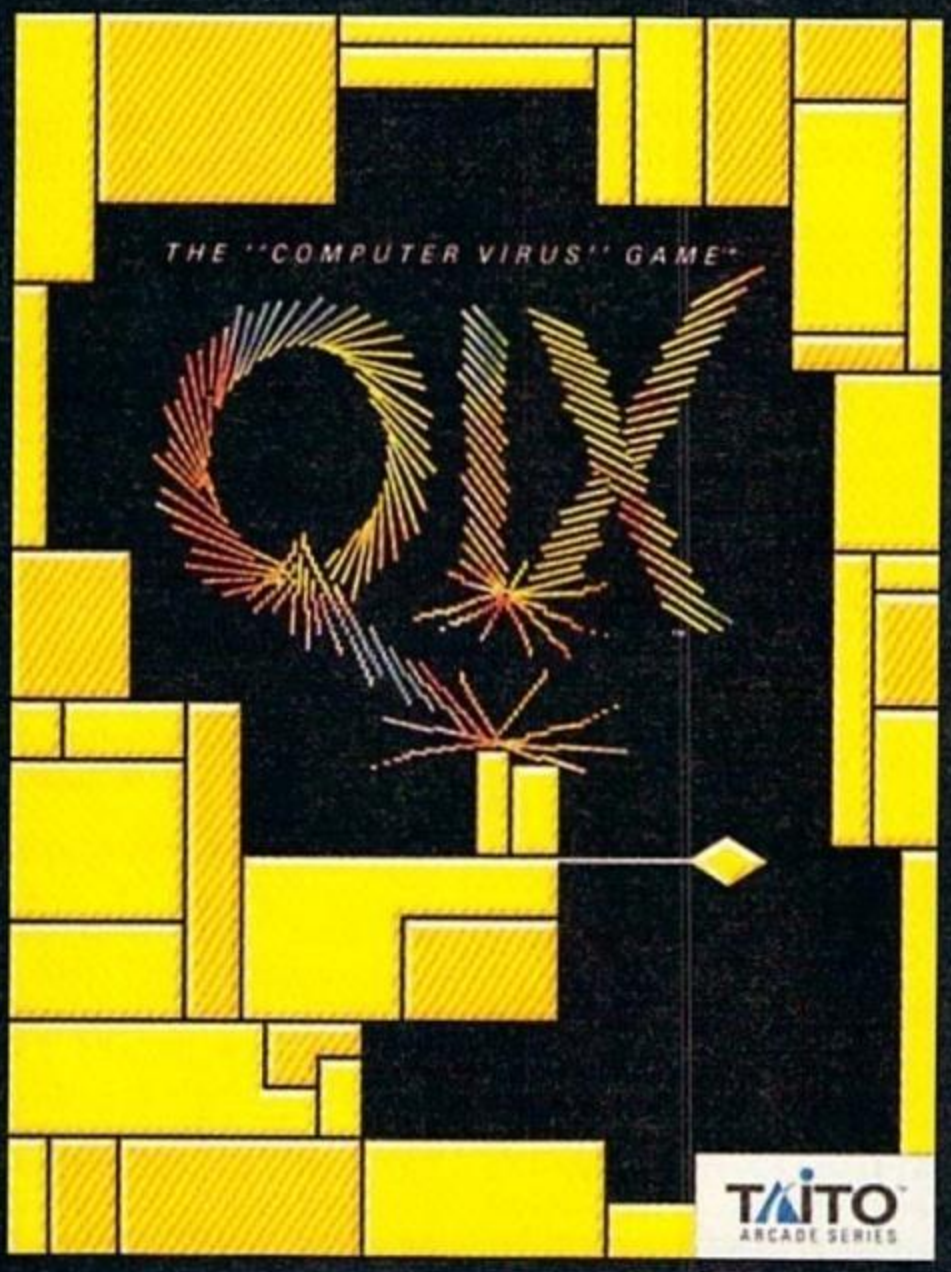

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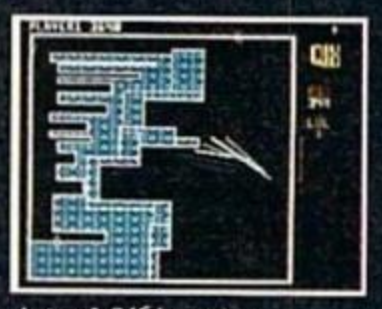

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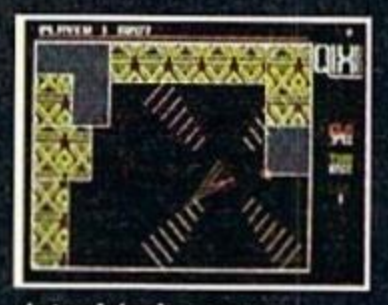

Actual Amiga screen.

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MAGIC

Load fonts into RUN Paint in four easy steps; add a new cursor to your C-128; position text on the C-64 screen.

Compiled by TIM WALSH

$540 FONTS FOR RUN PAINT 64/128

A few *RUN* readers wrote or phoned our editorial offices asking how to load fonts into RUN Paint (March 1989). It's easy; just follow these four steps:

1. Save one or more Commodore font files to a work disk.
2. Rename each font file to be used with RUN Paint with the prefix "RPF.". (For example, "ROUND FONT" is renamed "RPF.ROUND FONT".)
3. Run RUN Paint, then place the work disk with the renamed fonts into the drive, select the Font option from the Load menu and place the pointer on the filename of the desired font. Press the left mouse button (or joystick fire-button) to load it into RUN Paint.
4. Select the Text menu. Each font loaded into RUN Paint will be displayed. Select a font by placing the pointer on the font name and pressing the mouse or joystick button.

—TIM WALSH, MAGIC COLUMNIST

$541 GOING DOWN, ANYONE?

Letter Dropper, a 64- and 128-mode trick, makes the contents of A$ drop down from the top of the screen and stop on the fourth line from the top to form a statement. The letters may drop down to any line desired by changing the value of DD.

```
Ø REM 64/128 LETTER DROPPER - ERIK PEDERSE
  N                                    :REM*134
1Ø PRINT CHR$ (147): A$="RUN'S MAGIC TRICK
   S."                                 :REM*57
2Ø DD=4:L=LEN(A$):RM=(4Ø-L)/2-1        :REM*124
3Ø FOR J=1 TO L:AS=ASC(MID$(A$,J,1)):AS=AS
   *AS*2:M1$=MID$(A$,J,1):PRINT"{HOME}"
                                       :REM*89
4Ø IF M1$<>"{2 SPACEs}"THEN FOR K=1 TO DD-
   2:PRINT TAB(RM+J)M1$"{CRSR UP}" :REM*28
5Ø PRINT TAB(RM+J)" ":NEXT:PRINT TAB(RM +
   J)M1$:NEXT:PRINT                    :REM*174
```

—ERIK PEDERSEN, APO, NY

$542 GOING RIGHT, ANYONE?

If you prefer that the characters move out from the left of the screen to form a statement, then Left Letters Zoom is for you. As in the above trick, the statement resides in A$.

```
Ø REM LEFT LETTERS ZOOM - ERIK PEDERSEN
                                       :REM*174
1Ø PRINTCHR$(147): A$="RUN MAGIC TRICKS"
                                       :REM*151
2Ø L=LEN(A$):RM=(4Ø-L)/2-1             :REM*119
3Ø FOR X=L TO 1 STEP -1:AS=ASC(MID$(A$,X,1
   )):AS=AS*AS*3:M1$="{2 SPACEs}"+MID$(A$,
   X,1)                                :REM*69
4Ø IF M1$<>"{2 SPACEs}"THEN FOR K=1 TO X:P
   RINT TAB(RM+K-1)M1$"{CRSR UP}":NEXT:NEX
   T:PRINT                             :REM*6Ø
```

—ERIK PEDERSEN, APO, NY

$543 64 FAST DIRECTORY

Not only does 64 Fast Directory quickly display the C-64's disk directory, but it quietly resides in memory until needed. After you run the program, entering SYS 49152 in Direct or Program mode will display the disk directory.

```
Ø REM C-64 EASY DIRECTORY - JEFF PANICI
                                       :REM*96
1Ø PRINT"{SHFT CLR}":CK=.:PRINT"CHECKING:
   ":S=49152                           :REM*197
2Ø FORX=STOS+88:READD:POKEX,D:CK=CK+D:PRIN
   T"{HOME}{CRSR DN}"TAB(1Ø);CK:NEXT
                                       :REM*1Ø7
3Ø IFCK<>12836THENPRINT"ERROR!!!":END
                                       :REM*113
4Ø PRINT"{SHFT CLR}{CTRL 9}SYS 49152 TO SE
   E DIRECTORY.":END                   :REM*149
5Ø DATA 32,68,229,169,36,133,251,169,5,162
   ,8,16Ø,Ø,32,186,255,169,1,162  :REM*119
6Ø DATA 251,16Ø,Ø,32,189,255,32,192,255,16
   2,5,32,198,255,32,2Ø7,255,32    :REM*88
7Ø DATA 2Ø7,255,32,2Ø7,255,32,2Ø7,255,32,2
   Ø7,255,72,32,2Ø7,255,168,1Ø4   :REM*235
8Ø DATA 17Ø,165,144,2Ø8,22,152,32,2Ø5,189,
   169,32,32,21Ø,255,32,2Ø7,255   :REM*252
9Ø DATA 2Ø8,248,169,13,32,21Ø,255,184,8Ø,2
   14,32,2Ø4,255,169,5,76,195,255 :REM*226
```

—JEFF PANICI, SANDWICH, IL

$544 ECHO CLONE

While working on a Magic trick submission, I discovered a routine, familiar to users of telecommunication software, that produces an "echo" effect, printing two characters to the screen for each keypress. While this routine has little practical use, it can be incorporated into both 64- and 128-mode programs for telecommunication terminal package emulation. Pressing the left arrow key (←) exits the mode.

```
Ø REM 64/128 ECHO MODE EMULATOR - TIM WALS
  H                                    :REM*148
1Ø PRINTCHR$(147)"ECHO MODE EMULATION. PRE
   SS {LEFT ARROW} TO END":S=3:OPENS,S ►
```

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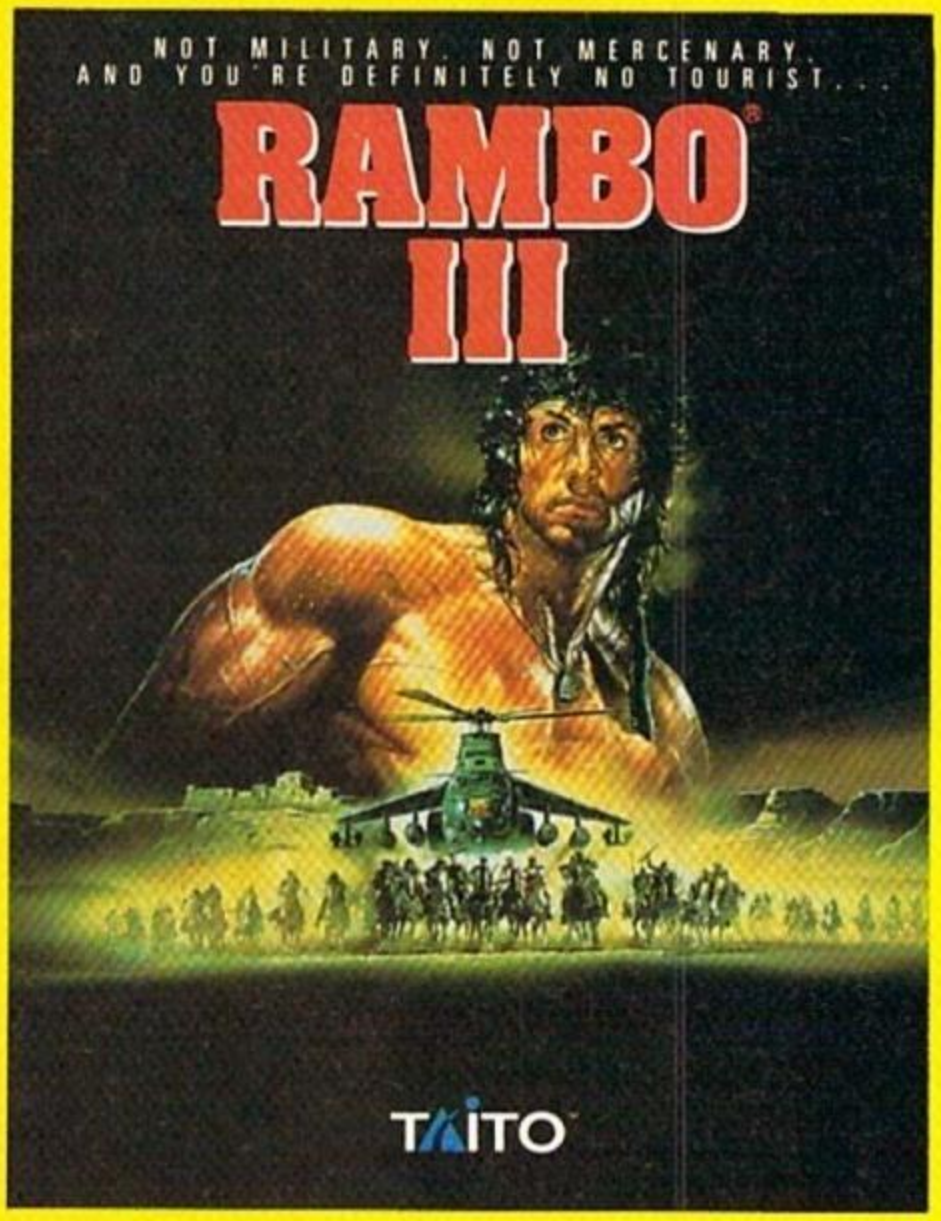
RAMBO III



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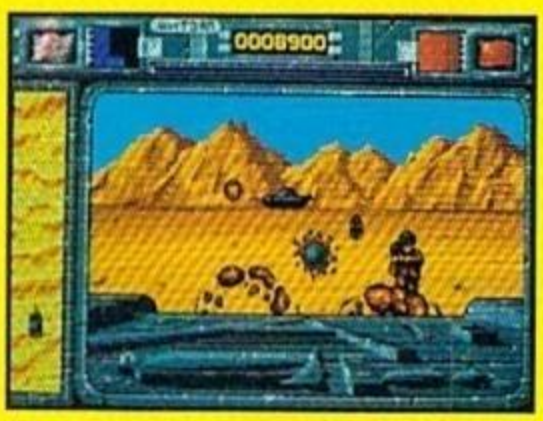

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```
                                        :REM*234
2Ø GET T$:IF T$="" THEN 2Ø              :REM*123
3Ø IF T$="{LEFT ARROW}"THEN 5Ø           :REM*93
4Ø PRINT T$;:PRINT#S,T$;:GOTO2Ø          :REM*23
5Ø END                                  :REM*178
```

—TIM WALSH, MAGIC COLUMNIST

$545 A WHOLE NEW C-128 CURSOR

Here's an eye-catching routine for the C-128. Underscore/Overscore Cursor 128 creates a cursor on the C-128's 80-column screen consisting of flashing top and bottom lines. Disable this cursor with the run-stop/restore combination.

```
Ø REM C-128 UNDERSCORE/OVERSCORE CURSOR -
  ELIAS TABELLO                         :REM*177
1Ø M=4864:FOR X=M TO M+17:READ A$:POKE X,
  DEC(A$):NEXT:SYS 4864                 :REM*248
2Ø DATA A9,1,A2,B,2Ø,CC,CD,A9,1B,2Ø,D2,FF,
  A9,55,2Ø,D2,FF,6Ø                     :REM*44
```

—ELIAS TABELLO, ISLINGTON, ONTARIO, CANADA

$546 DISK STAMP 64

Disk Stamp 64 lets you safely write an "invisible" copyright or identification message up to 79 characters long to your 1541-formatted, single-sided disk. Type in Disk Stamp 64 and run it, using an unimportant disk, then press the F1 key to write a new or edited message to disk. Once there's a Disk Stamp message on the disk, this program will display the invisible message. Press F5 to read another disk and press F7 to quit.

```
Ø REM DISK STAMP 64 - ROBERT COOK :REM*165
1Ø PRINT"DISK STAMP 64"                 :REM*226
2Ø PRINT"INSERT DISK AND PRESS SPACE"
                                        :REM*199
3Ø GETG$:IFG$<>" "THEN3Ø                 :REM*22
4Ø OPEN15,8,15:OPEN2,8,2,"#":PRINT#15,"U1"
  ;2;Ø;18;Ø:PRINT#15,"B-P";2;177        :REM*55
5Ø FORI=1TO79:GET#2,G$:G$=G$+CHR$(Ø):Z$=Z$
  +CHR$(Ø)                              :REM*11Ø
6Ø IF(ASC(G$)AND127)>31THENIN$=IN$+LEFT$(G
  $,1):NEXT                             :REM*214
7Ø PRINT"F1-WRITE TEXT TO DISK"         :REM*117
8Ø PRINT"F5-EXIT FOR NEW DISK"          :REM*136
9Ø PRINT"F7-QUIT PROGRAM"                :REM*41
1ØØ CR=LEN(IN$)+1:PRINT"{3 CRSR DNs}{CTRL
  1}"IN$" {CRSR LF}";                   :REM*174
11Ø CP=1Ø24+PEEK(214)*4Ø+(PEEK(211)-4Ø*-(P
  EEK(211)>39)):POKE212,Ø               :REM*121
12Ø CC=PEEK(CP):SL=LEN(IN$)             :REM*174
13Ø POKECP,CC+128:FORI=1TO64:GETG$:IFG$=""
  THENNEXT                              :REM*76
14Ø POKECP,CC:ON-(G$="{FUNCT 1}")-(G$="{FU
  NCT 5}")*2-(G$="{FUNCT 7}")*3GOTO2ØØ,2
  3Ø,23Ø                                :REM*129
15Ø IFG$="{CRSR RT}"ANDCR<=SLTHENCR=CR+1:P
  RINTG$;                               :REM*226
16Ø IFG$="{CRSR LF}"ANDCR>1THENCR=CR-1:PRI
  NTG$;                                 :REM*43
17Ø IFG$=CHR$(2Ø)ANDSL>ØANDCR=>SLTHENIN$=L
  EFT$(IN$,SL-1):CR=CR-1:PRINTG$;:REM*93
18Ø IFG$<" "ORG$>"{LEFT ARROW}"ORCR>79THEN
  11Ø                                   :REM*7
19Ø IN$=LEFT$(IN$,CR-1)+G$+MID$(IN$,CR+1):
  CR=CR+1:PRINTG$;:GOTO11Ø              :REM*27
2ØØ IN$=IN$+Z$:PRINT#15,"B-P";2;177
                                        :REM*13Ø
21Ø FORL=1TO79:PRINT#2,MID$(IN$,L,1);:NEXT
                                         :REM*6
22Ø PRINT#15,"U2";2;Ø;18;Ø              :REM*192
23Ø CLOSE2:CLOSE15:IFG$<"{FUNCT 7}"THENRUN
                                        :REM*163
```

—ROBERT B. COOK, WATERTOWN, MA

$547 HI-SPEED C-64 CURSOR POSITIONING

Positioning text on the C-64's screen has never been easier or faster if you use my Hi-Speed C-64 Cursor Positioning routine in your programs. This machine language utility can be entered in a minute or so, but be careful not to change any of the line numbers or the contents of the lines, most especially line 10, which contains the word REM, a space, then 25 Xs.

After typing in the program, run it, list it, then delete every line except line 10. Line 10 can then be added to your own C-64 programs as the first line in the program. To position the text, use this syntax:

SYS 2054, Row #, Column #:PRINT "YOUR MESSAGE"

```
1Ø REM XXXXXXXXXXXXXXXXXXXXXXXXX  :REM*145
2Ø FOR X= 2Ø54 TO 2Ø69:READ Y:POKE X,Y:CK=
  CK+Y:NEXT                             :REM*13
3Ø IF CK <> 23Ø2 THEN PRINT "ERROR IN DATA
  ...":END                             :REM*134
4Ø DATA 32,253,174,32,158,183,134,214,32,2
  41,183,134,211,76,16,229              :REM*42
5Ø REM RUN, THEN LIST AND DELETE LINES 2Ø
  THROUGH 5Ø THEN SAVE LINE 1Ø    :REM*1ØØ
```

—HENRY E. SHOTWELL, BERWICK, PA

$548 DISPLAYING C-64 STRINGS

The PRINT A$ command prints variable A$'s contents to the screen for your examination. Unfortunately, it won't properly print color commands, cursor movements and other non-printing characters.

The solution is to enter POKE 212,1 before printing the string. For example, if A$="{20 CRSR RTs}", then enter these commands to print A$:

POKE 212,1:PRINT A$

—RICHARD PENN, MONTREAL, QUEBEC, CANADA ■

Magic is a forum for RUN*'s imaginative and inventive readers to share their programming tips, brief software or hardware modifications, shortcuts or items of general interest. If you have an idea to make computing easier, faster, more exciting and enjoyable, send it to: Magic, RUN Magazine, 80 Elm St., Peterborough, NH 03458.*

RUN *pays $10 to $40 for each trick published in the column. If you'd like a copy of the latest edition of* RUN*'s Magic Trick Writer's Guide, send your request with a self-addressed, stamped, business-size envelope; you'll receive a copy in two or three weeks.*

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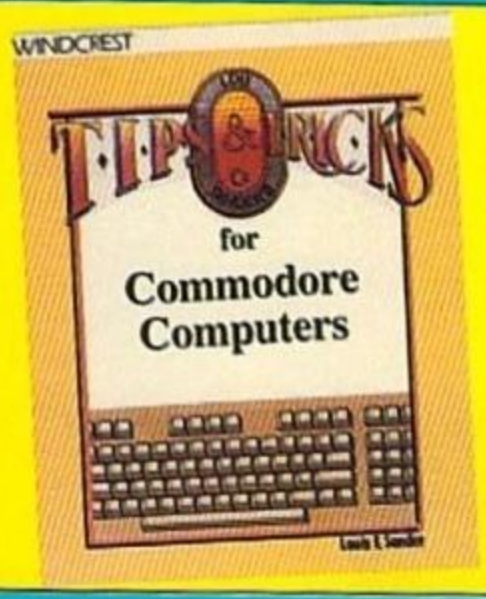

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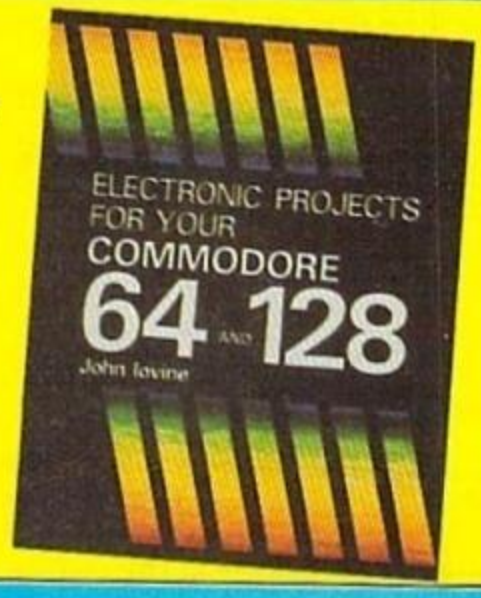

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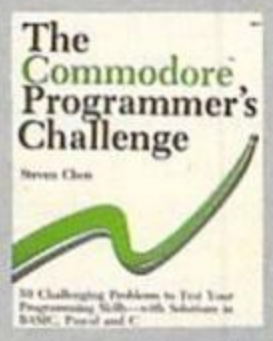

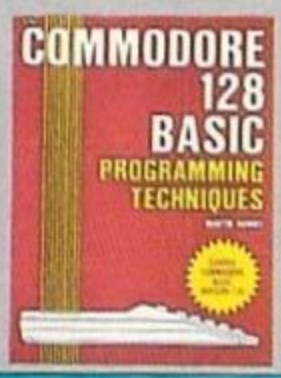

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NEWS AND NEW PRODUCTS

New prez at Commodore; printers galore; banish glare; games and more.

Compiled by HAROLD R. BJORNSEN

DON'T STARE AT THE GLARE

NORTHBROOK, IL—**Glare Eliminator**, an anti-glare, anti-reflective aerosol spray coating, is available from Opto-Technics (310 Melvin Drive, Unit 20, Northbrook, IL 60062) for $29.95. The optical coating eliminates glare and reflections from monitor screens with one application and lasts the lifetime of the monitor.

Check Reader Service number 400.

Treat as many as four monitor screens to permanently remove glare with the Glare Eliminator.

NEW HAND AT THE HELM

WEST CHESTER, PA—Commodore has named **Harold D. Copperman** as president and chief operating officer of Commodore's U.S. operations. He replaces Max Toy, who resigned to pursue other interests.

Copperman, 42, was formerly vice president and general manager of eastern operations for Apple Computer. Prior to that, he served with IBM for 20 years.

Irving Gould, chairman of Commodore, said, ". . .the hiring of an individual with Harry Copperman's experience and track record is a key element in our plan for building a strong U.S. operation."

Copperman said he plans ". . .to take advantage of Commodore's broad range of products to further penetrate the education market and to expand our use of value-added resellers. We will also continue to build and enhance our dealer distribution network."

A SPEEDY PRINTER

TORRANCE, CA—Epson America (23530 Hawthorne Blvd., Torrance, CA 90505) has released the **LX-800** 9-pin, 80-column serial dot matrix printer for the C-64 and C-128. It has bidirectional printing in Text mode and unidirectional printing in Graphics mode. Print speeds range from 180 and 150 characters per second in Draft mode to 30 and 25 cps in Near-Letter-Quality mode. Resident fonts include roman and sans serif. Bit image resolution is 60 to 240 horizontal by 72 vertical dots per inch. The printer ribbon is good for up to 3,000,000 characters. $299.

Check Reader Service number 402.

A SMALL LASER PRINTER

WEST CALDWELL, NJ—The **PC Laser 6000/EX**, a six-page-per-minute model, has an input paper tray that adjusts to accept letter-, legal- and international-size formats. It also can output on envelopes, transparencies and label stock. For high-volume printing, the laser's paper capacity can be expanded to 400 sheets by installing an auxiliary paper tray. The machine measures 8.1-by-16.1-by-16.5 inches and weighs 37 pounds. Available for $1895 from Ricoh Corp., 5 Dedrick Place, West Caldwell, NJ 07006.

Check Reader Service number 403.

MORE GAMES FOR THE C-64

HUNT VALLEY, MD—**Destroyer Escort**, a war game for the C-64, gives you control of one of the most versatile ships in naval history. You'll plan a route through and around enemy forces, and protect your convoy from the enemy. The package includes six routes to navigate, three levels of difficulty, four types of defensive weapons and seven different battle screens. $34.95.

In **Dr. Doom's Revenge**, a C-64 comic adventure, the evil genius has stolen a U.S. nuclear missile and threatens to detonate it over New York City if his demands aren't met. As Spider-Man and Captain America, you must invade Dr. Doom's fortress to save New York City from Armageddon. Available for $39.95.

Check Reader Service number 405.

ARM YOUR MONITOR

JAFFREY, NH—Curtis Manufacturing Company (30 Fitzgerald Drive, Jaffrey, NH 03452) introduces three **Curtis Monitor Arms**. Features common to all three models—the Standard ($69.95), the Executive ($139.95) and the Professional ($239.95)—include 360-degree arm and monitor platform rotation, plus three mounting options: the arms may be secured to a desk with a single- or double-swivel clamp, permanently bolted or screwed to a desk or wall. The Executive and Professional models have a monitor platform that tilts to 25 degrees and a keyboard rack that slides away when not in use. In addition, the Professional keyboard rack contains a tilt-option designed for easy keyboard adjustment.

Check Reader Service number 409.

A PRINTER FOR SMALL BUSINESSES

MOUNT LAUREL, NJ—Okidata (532 Fellowship Rd., Mount Laurel, NJ

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08054) announces a new nine-pin printer called the **Microline 172** for small businesses and the home office. The $289 machine has a 180 character-per-second Draft-mode speed, 144 cps high-speed draft, 120 cps Utility mode and a 30 cps near-letter-quality speed. It weighs 9.9 pounds and has a printhead life of 200 million characters.

Check Reader Service number 410.

News From *Science Digest*

THE LAWN RANGER—Having a tough time getting your teenager to mow the lawn? Then get the Lawn Ranger, a robotic lawnmower. After you've guided the robot Lawn Ranger around the perimeter of the yard with a joystick, creating a border of cut grass, it senses and moves over uncut grass inside the boundary, steering around trees, shrubs and other objects in its path.

SHORT CIRCUIT—Computer scientist Roger Lund has found a microscopic fiber that may be a common cause of electronic bugs. He inspected failing memory chips with a scanning electron microscope, revealing stray pieces of gold-silicon fibers used to weld components. Some of the fibers were big enough to stretch between on/off leads, thus shorting the circuits.

A C-64 IN A WRISTBAND?—Computer chips containing wires so small that 6,000,000 of them could fit in a human hair could result in cabinet-size supercomputers shrunk to the size of laptop models that are 1000 times faster.

Spotlight on Games

WESTLAKE VILLAGE, CA—Spotlight Software (4165 East Thousand Oaks Blvd., Westlake Village, CA 91362) has announced four new packages for the C-64. Each retails for $29.95.

In **DeathBringer**, a fantasy role-playing game for the C-64, you'll assume the part of a barbarian hero who must reclaim five magical gems to stop an evil wizard from casting his spell of doom.

When the moon eclipses the sun in the adventure game, **Total Eclipse**, an ancient Egyptian curse will be triggered, causing the moon to explode and a cascade of meteors to plummet towards the Earth. As an archaeological explorer, you'll travel through a giant pyramid to locate and destroy a secret shrine holding the power of the curse.

Faster than soccer, more aggressive than hockey, **Speedball**, an arcade-action game, has you drop into an arena of solid steel, where you must try to guide a rapid-fire solid metal ball toward a goal while avoiding lethal blows from the enemy.

In **Dark Side**, an adventure game, you become the mercenary of the future, a one-man army who must save the world from imminent destruction. Armed with lasers, shields and a jet power pack, you'll follow orders to locate and destroy a world-threatening weapons system in a heavily guarded military zone before time runs out.

Check Reader Service number 406.

Don't Let the Candle Die!

SAN MATEO, CA—In **The Magic Candle**, a medieval fantasy role-playing game for the C-64, you must save the land of Deruvia from the wrath of the arch-demon, Dreax, who's been imprisoned within the candle's flame for ages. In your mission, you'll encounter many monsters and use special skills, such as sword swinging and casting magic spells. You'll also explore 54 dungeon levels, six towns, six villages and two castles, and speak with the natives of Deruvia in your quest for the lost knowledge needed to stop the candle from burning out. Begin your search for $39.95. Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404.

Check Reader Service number 407.

See-Through Keyboard Cover

FORT WALTON BEACH, FL—**Keyskin Plastic Keyboard Covers** are designed to protect your computer keyboard against dust, spills and anything else that could cause damage. The covers are so thin that you can type with them in place. They're available for the Commodore 64, PC-10 and Amiga computers for $25.95. CompuCover, 2104 Lewis Turner Blvd., Fort Walton Beach, FL 32548.

Check Reader Service number 401.

Mind-Blowing Rolling

REDWOOD CITY, CA—Epyx (PO Box 8020, Redwood City, CA 94063) introduces **Mind-Roll**, a C-64 arcade game where players bump, bash, roll and crash through a multi-dimensional puzzle that's set on ten different planes. Each plane is more difficult than the last, and gamers can set them up in any order for play or practice. Using a joystick, players walk a plank, hunt for hidden amulets, fill a fickle screen with tiled squares or score big by rolling over puzzle squares in a predetermined sequence. The seventh plane features "time boosters" to give gamers extra time to negotiate obstacle courses, roar down a racetrack or blaze through a maze. Available for $29.95.

Check Reader Service number 412.

Women Involved In Equipment Decisions

NEW YORK—A *Working Woman* magazine survey of 100 women managers reveals that approximately three-quarters of them worked in businesses that purchased new high-technology office equipment during the past year. Seventy-five percent of the women polled said they played an active role in the purchasing process.

About half of the companies employing the respondents bought personal computers last year. In these companies, 62 percent of the respondents initiated the idea to purchase, 70 percent evaluated various brands and models, and 57 percent made the final purchase decision.

Of the 79 percent who had direct contact with equipment salesmen, 40 percent felt they were being talked down to because they were women.

Forty percent of the women polled said they were interested in science and technology when they were growing up. Half of the respondents had some courses in school and 60 percent received on-the-job training. Seventy-five percent said they did things on their own to help them deal with new equipment, such as reading manuals, taking courses and consulting with others.

One-third of the respondents felt portrayals of women in ads for equipment were generally positive, while 26 percent thought they were negative.

Treasures for the Taking

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Check Reader Service number 408. ■

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MAIL RUN

Readers respond to Commodore's attitude toward customer service and support.

RUNning Responses

The suggestion in the RUNning Ruminations editorial about Commodore support and service that Commodore set up Loren Lovhaug in business as a service agency for the C-128 sounds excellent and would certainly have my support.

—Warren Coleman, MD
Monroe, LA

I bought a C-128 and was pleased with it. Unfortunately, most computer stores I stopped in for software and hardware gave me the impression that they didn't want to handle a "toy." I've no place to buy anything for my computer except through ads in *RUN*. And, as for service, nobody wants to talk Commodore.

—Jack W. Fisher
Estero, FL

An Unkinder, Ungentler Commodore?

I think you are being too fair to Commodore in stating that their service record is poor because users buy from discount stores instead of supporting those who both sell and service Commodore computers. I buy all my appliances from discount stores, which always include a list of service people in the area. If General Electric can do it, why can't Commodore?

—Dorothy A. Wilson
Newburyport, MA

Supporting the Dealer

If one is to expect service and support from the local Commodore dealers, it's only fair to support the dealer. If it's difficult to justify the expenditure of a few additional dollars for the product, then think of it as a service contract. The return far outweighs the cost.

Also, if dealers are supported by computer users, they will have a larger voice concerning product support and service policies. To complain about a problem of our own making is like closing the barn door after the animals have escaped.

—Trevor J. Skidmore
Milton, Ontario, Canada

Commodore should give its dealers 100 percent support so that they will feel confident in handling the manufacturer's equipment and in supporting the customers who buy their machines. I will support a dealer where I can buy equipment and in return get support and good software.

—Frank W. Fife
Rapid City, SD

Give 'Em Hell, Larry

I'd like to be counted among the disgusted about Commodore service and support. Before 90 days passed, my power supply failed. I took it to an authorized agent and was told that they would fix it "within 90 days" and that there would be a "handling charge" of $20. This indicates to me the value of Commodore's "warranty." I bet the power supply retails for not much more than the handling charge. It's interesting to note the glowing promises in Commodore's ads and then experience the "to hell with you" attitude after the sale.

—John H. Larry
St. Albans, VT

I'd Rather Switch Than Fight

None of the stories in "At Your Service?" surprised me. I've fought in Commodore's defense for many years, but I'm coming to the end of my rope. I think I'll stop fighting and join the IBM PC-compatible crowd, and it won't be a Commodore product—I'm looking at products that are backed by service and support.

—Darryl G. Lowen
Las Cruces, NM

I think that Loren Lovhaug and *RUN* were far too kind in describing the quality of Commodore products. I went through two C-128s and two 1571 disk drives before my system worked properly. Just the aggravation of getting a C-128 repaired is enough to make a grown man cry. Several of my friends have switched to IBM-PCs or clones. I intend to do the same soon.

Also, I believe interest in Commodore's products may be eroding faster than you think. In this area, book stores no longer sell Commodore books and manuals, and Commodore-specific magazines are no longer being sold in some stores that used to carry them.

—Charles G. Nelson
Baltimore, MD

Finding Reliable Service

To avoid the problems users experience with authorized Commodore service centers, they should change centers until they find a satisfactory one. While this may not be practical for some people, I'm sure many users could benefit from it.

The following advice should also be helpful. Ask if they do repairs on the premises; know what you're talking about when you talk Commodore computers; try to meet and speak with the actual servicer; and remember, greased wheels move faster.

—Keith Sills
Rego Park, NY

Readers: For a current list of authorized service centers in your area, contact Commodore's customer support number, 215-436-4200, in West Chester, PA.

—Editors

A Call to Readers

This page is your stage, so stand up and say a few words. Extend praise, air grievances or offer hands-on advice and information.

Send your letters to Mail RUN, 80 Elm St., Peterborough, NH 03458. Each letter must include the writer's name and complete address. RUN *reserves the right to edit letters for style, clarity and space.* ■

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RUN's READER CHOICE CONTEST

YOU COULD WIN ALL OF THE SOFTWARE LISTED ON THIS PAGE

WELCOME TO *RUN*'S SECOND ANNUAL READER CHOICE CONTEST. This is an opportunity for you—the reader—to vote for your favorite entertainment software developed over this past year. You must choose from among almost 200 entries.

The rules for this contest are simple. You select your five favorite games from the ballot listed below. Tear out the entire ballot and send it in. That's all there is to it! Be sure to include your name and address to be eligible for our drawing. We will select one lucky *RUN* reader as the winner of a fabulous grand prize—all of the game software listed on the ballot!

To enter, simply choose your five top games from the list below and send in your selections before August 10, 1989. There will be ten prize winners in all. The winners, as well as the results of the voting, will be published in the December 1989 issue of *RUN*.

RULES: ► Only one ballot per person and only five selections per ballot. ► Anyone of any age may enter, but prizes won by a minor must be claimed by parent or legal guardian. ► Drawing will be held September 8, 1989. ► First prize: All the software listed on the ballot, subject to availability. ► Second prize: A library of ReRUN disks. ► Third prize: A collection of *RUN* productivity software. ► Fourth through tenth prizes: Subscriptions to *RUN*, ReRUN or *RUN*'s special disks. ► *RUN* employees and their families are not eligible.

Software titles are listed below according to the distributor, not necessarily the manufacturer.

ACCESS SOFTWARE
5-1 ☐ Heavy Metal

ACCOLADE
6-1 ☐ Jack Nicklaus' Greatest 18 Holes
2 ☐ Grand Prix Circuit
3 ☐ TKO
4 ☐ Rack 'Em
5 ☐ Serve & Volley
6 ☐ Steel Thunder
7 ☐ Fast Break
7-1 ☐ Jet Boys
2 ☐ Bubble Ghost
3 ☐ Card Sharks
4 ☐ Power at Sea
5 ☐ The Train: Escape to Normandy
6 ☐ Plasmatron

BLUE LION SOFTWARE
8-1 ☐ Ticket to Hollywood
2 ☐ Ticket to Washington, D.C.

BRODERBUND
9-1 ☐ Star Wars
2 ☐ Arcade Game Construction Kit
3 ☐ Carmen Sandiego—Europe
4 ☐ Ultima V
5 ☐ Times of Lore
6 ☐ Tangled Tales

BUENA VISTA SOFTWARE
10-1 ☐ Who Framed Roger Rabbit?

CALIFORNIA DREAMS
11-1 ☐ Vegas Craps
2 ☐ Vegas Gambler
3 ☐ Club Backgammon
4 ☐ TrianGO
5 ☐ Mancala

CINEMAWARE
12-1 ☐ The Three Stooges
2 ☐ Rocket Ranger
3 ☐ Sinbad: Throne of the Falcon

COSMI
13-1 ☐ Triple Crown Challenge
2 ☐ The President is Missing
3 ☐ Chernobyl
4 ☐ NavCom 6
5 ☐ Grand Slam Baseball
6 ☐ Navy Seal
7 ☐ Chomp!

DATAEAST
14-1 ☐ Ikari Warriors
2 ☐ Victory Road
3 ☐ Platoon
4 ☐ Speed Buggy
5 ☐ Q*bert
6 ☐ TNK III
7 ☐ Kid Niki
8 ☐ RoboCop
9 ☐ Karnov

DIGITEK
15-1 ☐ Vampire's Empire
2 ☐ Western Games
3 ☐ Miniature Golf

DISCOVERY SOFTWARE
16-1 ☐ Zoom!

ELECTRONIC ARTS
17-1 ☐ Lancelot
2 ☐ Time and Magik
3 ☐ Firezone
4 ☐ Annals of Rome
5 ☐ Borodino 1812
6 ☐ BattleDroidz
7 ☐ Global Commander
8 ☐ The Rubicon Alliance
9 ☐ The Hunt for Red October
0 ☐ Cosmic Relief
x ☐ Tobruk
y ☐ Alternate Reality: The City
18-1 ☐ Double Dragon
2 ☐ Rockford
3 ☐ Roadwars
4 ☐ Battles of the Civil War: Vol. I
5 ☐ Battles of the Civil War: Vol. II
6 ☐ Rommel Battles for North Africa
7 ☐ MacArthur's War
8 ☐ Pool of Radiance
19-1 ☐ First Over Germany
2 ☐ Typhoon of Steel
3 ☐ Battles of Napoleon
4 ☐ Questron II
5 ☐ Overrun
6 ☐ Hillsfar
7 ☐ Demon's Winter
20-1 ☐ Powerplay Hockey: USA vs. USSR
2 ☐ Jordan vs. Bird: One on One
3 ☐ Deathlord
4 ☐ Caveman Ugh-Lympics
5 ☐ Modem Wars
6 ☐ Mars Saga
7 ☐ Bard's Tale III
8 ☐ Project Firestart
9 ☐ Patton vs. Rommel
0 ☐ Wasteland

EPYX
21-1 ☐ Mind-Roll
2 ☐ Technocop
3 ☐ The Legend of Blacksilver
4 ☐ Street Sports Football
5 ☐ Dive Bomber
6 ☐ L.A. Crackdown
7 ☐ Battleship
8 ☐ Space Station Oblivion
9 ☐ The Games—Winter Edition
22-1 ☐ The Games—Summer Edition
2 ☐ Tower Toppler
3 ☐ Metrocross
4 ☐ Sports-a-Roni
5 ☐ Final Assault
6 ☐ Street Sports Soccer
7 ☐ 4×4 Off-Road Racing
8 ☐ Impossible Mission II
9 ☐ Sporting News Baseball

FIRST ROW SOFTWARE
23-1 ☐ Star Empire
2 ☐ The Honeymooners

GAMETEK
24-1 ☐ Double Dare
2 ☐ Hollywood Squares

HI-TECH EXPRESSIONS
25-1 ☐ Matterhorn Screamer
2 ☐ Chase on Tom Sawyer's Island
3 ☐ Win, Lose or Draw

INTRACORP
26-1 ☐ Ultimate Casino Gambling
2 ☐ Murder on the Atlantic

KONAMI
27-1 ☐ Boot Camp
2 ☐ Rush 'N Attack
3 ☐ Contra

MASTERTRONIC
28-1 ☐ Monopoly
2 ☐ Scrabble
3 ☐ Risk
4 ☐ John Elway's Quarterback
5 ☐ Barbarian
6 ☐ Skate Crazy
7 ☐ Raw Recruit
8 ☐ CA Pro Golf

MEDIAGENIC
29-1 ☐ F-18 Hornet
2 ☐ Zak McKracken
3 ☐ Neuromancer
4 ☐ Faery Tale Adventure
5 ☐ MainFrame
6 ☐ Black Jack Academy
7 ☐ Corruption
8 ☐ Enlightenment
9 ☐ Jinxter
30-1 ☐ BattleTech
2 ☐ F-14 Tomcat
3 ☐ Chop & Drop
4 ☐ Take Down
5 ☐ USS Ocean Ranger
6 ☐ Rampage
7 ☐ Predator
8 ☐ Star Rank Boxing II
9 ☐ Last Ninja 2

MICROPROSE
31-1 ☐ Keith Van Eron's Pro Soccer
2 ☐ Pure-Stat Football
3 ☐ Red Storm Rising
4 ☐ Master Ninja

MINDSCAPE
32-1 ☐ Aussie Joker Poker
2 ☐ Out Run
3 ☐ Alien Syndrome
4 ☐ Space Harrier
5 ☐ Thunder Blade
6 ☐ International Team Sports
7 ☐ 720°
8 ☐ Willow
9 ☐ Uninvited
0 ☐ Winter Challenge
x ☐ Captain Blood
33-1 ☐ Road Runner
2 ☐ Indiana Jones
3 ☐ Clubhouse Sports
4 ☐ Harrier Combat Simulator
5 ☐ Blockbuster
6 ☐ MISL Soccer
7 ☐ Combat Course
8 ☐ Road Raider
9 ☐ Action Fighter

SCORPION
34-1 ☐ Alien Destruction Set
2 ☐ The Mandroid Files
3 ☐ Purple Heart

SHAREDATA
35-1 ☐ Classic Concentration
2 ☐ Card Sharks

SIR-TECH SOFTWARE
36-1 ☐ Wizardry I
2 ☐ Wizardry II
3 ☐ Deep Space

SUBLOGIC
37-1 ☐ Stealth Mission

SPECTRUM HOLOBYTE
38-1 ☐ Zig-Zag
2 ☐ Tetris
3 ☐ Soko-Ban

TAITO
39-1 ☐ Operation Wolf
2 ☐ Alcon
3 ☐ Arkanoid
4 ☐ Bubble Bobble
5 ☐ Rastan
6 ☐ Renegade
7 ☐ Sky Shark

THREE-SIXTY
40-1 ☐ Dark Castle

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SOFTWARE GALLERY

Mix arcade action with a little mystery, add sports to a few unique programs, and you've got this month's reviews!

Compiled by BETH S. JALA

HOMETOWN, U.S.A. ..... A+

Let Creativity Abound In Your Own Hometown

I love software that does something different. I never imagined that I'd review a Commodore program that brings to life the charm and beauty of Norman Rockwell's small-town America. The final product from Hometown, U.S.A. is a group of customized buildings, sized to HO scale to fit in well with model trains and cars.

Basically, this is a graphics editor program applied to a specific application. If you had the artistic ability and patience, you could create similar items with almost any good graphics editor. Most of us, however, are not blessed with those gifts and therefore welcome all the help we can get.

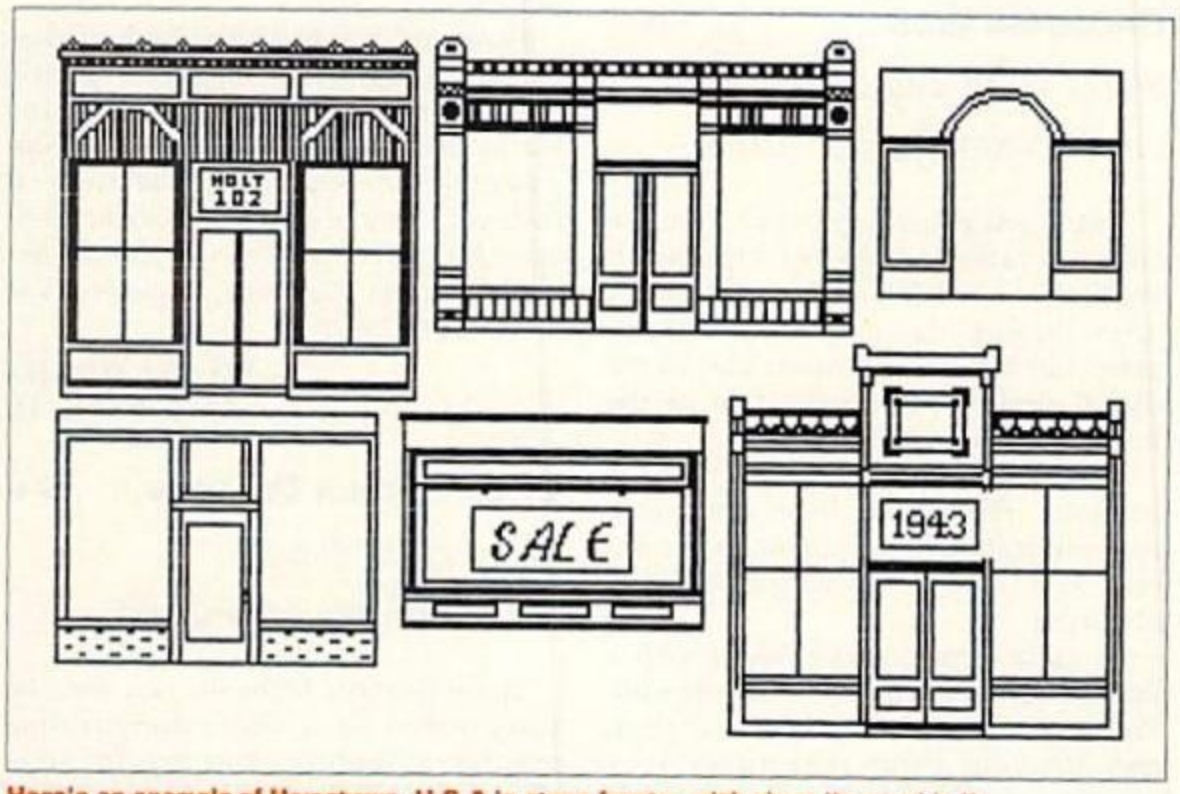
Hometown U.S.A. can work with either one or two disk drives. You can use a joystick, but I found it just as easy to operate from the keyboard. A good variety of printers are supported, and I had no trouble using my Okidata 180, either in Commodore Emulation mode, or as an Epson-compatible with a Xetec Super Graphix interface.

You start with a selection of more than a dozen basic building designs, including several types of stores, a church, gas station, railroad station and houses. A few additional files provide signs and other small touches.

The very first thing I noticed about Hometown, U.S.A. is that it loads quickly, even from a 1541 drive. The screen directions, especially when supplemented by the two books that are included with the program, are concise and easy to understand. Before you know it, you're actually designing your first model.

The display is monochrome; no color is used throughout. Since the printout is intended to be black and white, you're not lured into seeing something onscreen that your printer can't produce.

The program's editor lets you load two separate screens into memory at the same time, which makes it quite easy to cut and paste items from one screen to another. You can also add text, use the Fill command to change the appearance of the model's surface, or select a graphics editor to perform pixel-level drawing. The Erase, Wipe and Undo commands let you correct mistakes or change your mind.



Here's an example of Hometown, U.S.A.'s store fronts, with signs "pasted in."

When done, you save your enhanced building designs to disk to work on them later or to exchange them with your friends who also have the program. You'll probably want to print them in order to actually construct the model.

Printing is the only area where I found something unexpected. The printouts take only about half of a sheet of paper. Normally, I would expect the printing to be completed by sending a form feed command to the printer, but Hometown, U.S.A. doesn't do that. I thought at first that it might be an oversight, but I've since decided that it was probably done to conserve paper. Either way, it's a minor point.

The small buildings can probably be constructed directly from the computer printout if you use heavyweight paper. For longer-lasting models, the authors suggest that you carefully glue the printout to thin cardboard before beginning construction. You can then color or paint the models.

It's been a long time since I've seen software that offered something fun and unique, while meeting all my basic ►

REPORT CARD

A Superb!
An exceptional program that outshines all others.

B Good.
One of the better programs available in its category. A worthy addition to your software library.

C Average.
Lives up to its billing. No major hassles or disappointments here.

D Poor.
This program has some problems. There are better on the market.

E Failure.
Many problems; should be deep-sixed!

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criteria for a good program. Hometown, U.S.A. is well designed, easy to use and delivers its promises. I think you'll enjoy it. I give it my highest recommendation. *(Publishing International, 333 West El Camino Real, Suite 222, Sunnyvale, CA 94087. C-64/$39.95.)*

—JIM GRUBBS
SPRINGFIELD, IL

OPERATION WOLF ..... A–

Strike Hard and Strike Fast For Non-Stop Jungle Action

Taito's ads proudly proclaim that the coin-operated edition of Operation Wolf is "The World's #1 Arcade Game!" After playing the new C-64 version, many fast-action enthusiasts may agree that it deserves the same title in the home computer market.

The program challenges you with six missions. They range from destroying communications equipment in an enemy base camp to rescuing hostages at an airport.

In each scenario, you begin with a limited number of bullets and grenades. Power-up symbols randomly appear, and shooting them replenishes your supplies, renews your strength and furnishes dynamite and high-speed automatic fire.

Battling you every inch of the way are all sorts of nasties who must be eliminated before each level is completed. Most numerous are the ground troops who pop into view and blast away with small arms. Far more dangerous, however, are the helicopters, gunboats and armored cars that target you with more powerful weapons. There's only one way to deal with all these foes: Center them in your on-screen cross hairs and shoot them before they get you. Otherwise, the wounds they inflict will drain away your vitality and end the game.

The coin-operated Operation Wolf has a replica of a machine pistol as its control. In the C-64 version, either a joystick or a 1351 mouse takes its place. The joystick does everything except toss grenades, which are launched by pressing the space bar. Although this arrangement provides just enough control to let most players survive temporarily, the greater precision that a mouse offers makes it much more effective.

Operation Wolf has terrific graphics and sound, and even better animation. In fact, the on-screen gyrations of certain enemy soldiers are so fascinating that they often divert your attention from more dangerous foes.

These excellent sensory elements are major contributors to the game's atmosphere of feverish frenzy. Serious play inevitably results in sweaty palms and a quickened pulse. Although having to select the proper weapon for each situation does provide some strategic richness, this is basically a thrill-a-minute game, which might even be too intense and difficult for some novice players.

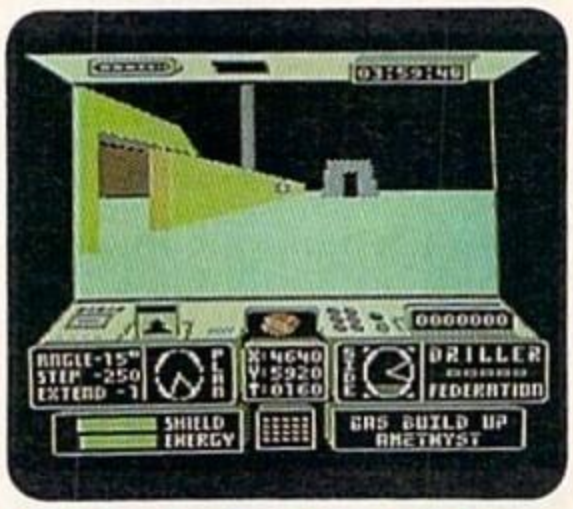
However, it's just this kind of desperate struggle that long-time arcade warriors lust after. As a result, many battle-tested veterans of electronic campaigns will put Operation Wolf high on their lists of must-buy games. *(Taito Software, Inc., 267 West Esplanade, North Vancouver, British Columbia, Canada V7M 1A5. C-64/$29.95.)*

—WALT LATOCHA
OAK PARK, IL

SPACE STATION OBLIVION .... B+

Space is the Place For a Gaseous Adventure

Space Station Oblivion can best be categorized as a three-dimensional graphic adventure. You are in Amethyst, one of 18 square sectors that, when joined together, form the polyhedral planet of Mitral. Each of the other sections is also named for a precious gem or mineral: Diamond, Ruby, Emerald, and so on.



Can you save the planet Mitral from a devastating explosion and certain destruction in Space Station Oblivion?

Your mission is to locate a specific drilling point within each sector and release the dangerous gas build-up below the surface. Unfortunately, you have only four Mitral hours to do so. And although Mitral is uninhabited, several dangerous security devices remain active. Some can be avoided but others must be deactivated.

Exploring is accomplished through an excavation probe equipped with a dual-action laser system. In addition, if you can find the reconnaissance jet, you'll be able to fly over Mitral and get an overview of your surroundings. Both the probe and the jet are powered by energy from Rubicon crystals.

The most impressive thing about Space Station Oblivion is the realistic way the perspective of your surroundings changes as you move around the planet. Walls, buildings and other solid structures appear exactly as you would expect them to from any viewing angle. However, because of the fraction of a second it takes the C-64 to calculate and re-draw views, the animation does not scroll smoothly. Nevertheless, the ability to roam freely over Mitral's surface makes this 3-D adventure world seem very realistic, especially when compared to graphic adventures that restrict you to a limited number of predrawn views that are stored on disk and called up at different times in the game.

Another feature that helps make up for the blocky animation is the large variety of movement and viewing options. For example, the angle of your turns can be adjusted from five to 90 degrees, or a 180-degree turn can be made with a single keystroke. Similarly, the distance you move with each push of your joystick can be set from one to 250 steps.

Space Station Oblivion has the complexity to keep most explorers busy through several sessions and enough puzzles and variety to keep things interesting. If you feel that you could use some guidance in locating some of the hidden drilling spots or in gaining access to some sectors, you'll find several pages of tips in Epyx' *Masters Collection Advanced Hint Book. (Epyx, 600 Galveston Drive, Redwood City, CA 94063. C-64/$39.95.)*

—BOB GUERRA
SOUTH BOSTON, MA

STORYWRITER 128 ..... B

Get Those Creative Juices Flowing!

StoryWriter 128 offers a cure for writer's block by prompting you for all the ideas and individual details you'll need to create pages of hopefully interesting prose. The program asks you a series of questions. You must supply details about the setting and plot of your story, an extensive description of your protagonist and antagonist, and delineate ►

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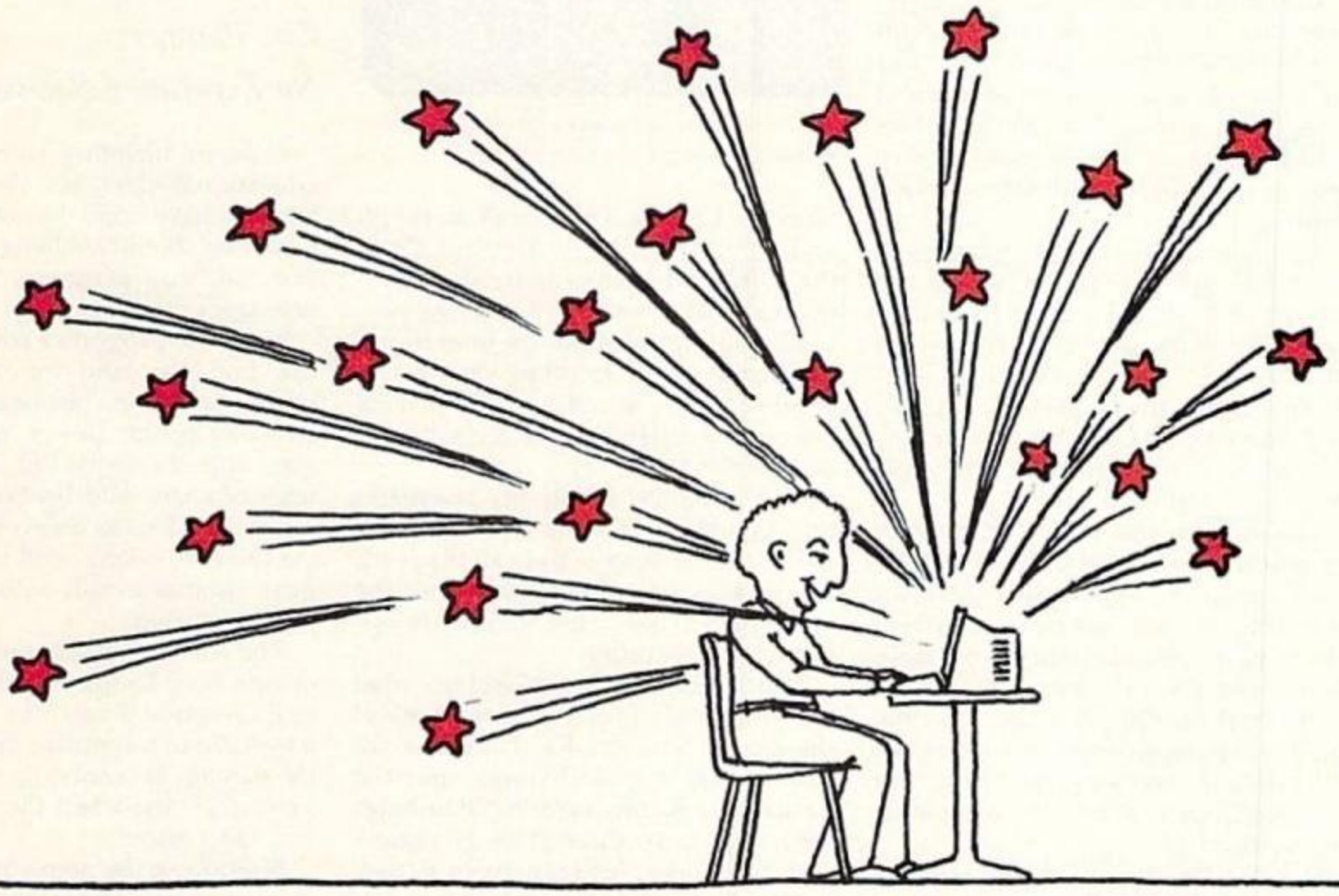

***RUN*'s FUN PAK 128** is a gamester's dream come true! This brand new collection was created in response to overwhelming demand for quality games for the C-128 in 40 or 80 column modes. And since it comes to you from *RUN* Magazine, you're assured of top quality software at an economical price! We won't try to spoil your excitement when your FUN PAK arrives, but here's a sneak peek at what you'll get...

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Please Note! FUN PAK 128 games have not appeared in *RUN* Magazine...or anywhere else. All are new, unique, and lots of fun.

Call Today. Have Fun Tonight. (Actually, it will take four to six weeks for your FUN PAK to arrive, but the sooner you order, the sooner you'll start to have night upon night of fun and delight.) So don't wait! If you own a C-128, this collection of games is for you! To order, call **1-800-343-0728** or mail this coupon.

FUN PAK 128

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the story's conflict and climax.

These are things that most untrained writers never even think about, let alone plan in advance. Yet, even if you have only a vague idea of what your story will be about when you sit down at your computer, you'll be amazed at how easy it is to create a complete outline with just a little coaching from StoryWriter.

StoryWriter's screen features seven windows, one for each category and another for prompts and text entry. You can switch among them at the touch of a key. The cursor keys let you hop quickly about to review what you've written and add, edit or delete before printing.

Now when you boot up your word processor, you'll find the words are primed and ready to flow. I found it useful to work with a printout of StoryWriter's outline next to my keyboard. Others might prefer to simply load StoryWriter's outline file directly into their word processor and build their story around it.

So simple to use that it comes with no instructions, StoryWriter does have a few limitations. One is that the completed outlines are only two levels deep, a fact that limits your ability to organize large amounts of information. Also, word-wrap on the printouts is a little buggy. Outlines printed on a Panasonic KX-P1090 occasionally had one or two truncated words that were completed on another line.

StoryWriter also annoys by refusing to save a revised outline unless given a different name. This is a minor defect, except that after the screen flashes "Disk Error," your outline is cleared from the screen. Don't worry, it's still in memory and can be displayed again by cycling through the categories.

However, these are minor problems with what is clearly an innovative and valuable little program. *(Country Road Software, 70284 C.R. 143, Ligonier, IN 46767. C-128/$12.)*

—JOHN PREMACK
LEXINGTON, MA

POWERPLAY HOCKEY: USA VS. USSR ..... B

Drop Pass, Fakes to the Right, Skates Down the Middle, Slap Shot, and He Scores!

A famous comedian once remarked that he went to the fights and a hockey game broke out. Well, Powerplay

In Powerplay Hockey, you control the center, who always wears the darker jersey.

Hockey: USA vs. USSR isn't as rough and tumble as NHL hockey, but it isn't the Ice Capades either. Excessive body-checking, icing and crosschecking provokes your opponent into a brief round of fisticuffs, while brawling gets the offending player tossed into the penalty box. As the instructions state, "Glasnost and ice don't mix."

This program admirably re-creates the 1980 Winter Olympic matchup between the two teams. You can play with two gamers, go one on one against the computer, or pit a five-man team opposite the computer.

In both the one-on-one and five-man versions, you direct the movement of the center. The game's skill levels are Junior, Minor and Olympic, and the periods can be two, eight or 20 minutes long. You have three lines of skaters and can toggle between them if they start to fatigue. At the end of each period, a stat screen displays the goals and attempts of each player. Depending on the winner at the conclusion of the game, you're transported to either Washington, D.C. or the Kremlin.

Playing the game is very much akin to watching live-action hockey. Players who overskate lose control, slip on the ice, fall on their faces or overshoot their target. Keep in mind that it's not easy to "stop on a dime."

Also, since the action is always around the puck, try to keep one eye on it and the other on your center, because it's possible for him to skate off the screen and miss everything.

Needless to say, this game takes some time to master. The instructions give some tips on how to pass, skate and score, but practice, trial and error are still the best ways to learn. Depending on your joystick, your hand may tire, and the stick will begin to slip. I discovered that wearing a leather (fingerless) driving glove eased the problem.

A nifty item is included with this package: a poster of a helmeted "Gorby," suitable for framing. *(Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/$24.95.)*

—BOB SODARO
FAIRFIELD, CT

SIMCITY ..... B–

Help Wanted: City Planner; No Experience Necessary

Expertly blending entertaining and educational elements, the creators of SimCity have crafted a series of design tools that should challenge and delight armchair city planners, builders and managers of all ages.

From the program's edit screen, you can bulldoze land for development; construct homes, businesses, factories, airports, parks, power plants, waterways and sea ports; link zones by systems of roads and bridges; and bring power to all areas. Selections are made via the arrow keys, and structures appear instantaneously with a click of the joystick button.

The edit screen also includes tools of destruction. To spice up the life of your city, you can unleash fires, earthquakes, a tornado or a reptilian monster. While the damage is occurring, you can try to save your city; when the crisis is over, you can rebuild.

Features of the map screen include a city overview and various physical and demographic maps. Editing existing terrain, having the computer randomly create new locales, and saving and loading your own creations are also possible.

In the graph screen, you can call up a series of line graphs that help you track the progress or decline of your city over a period of time.

The program rewards those who build cautiously and economically, with the proper ratio of homes to businesses and factories. At first, very little money is available. In time, when taxes start coming in, more costly items, such as airports, can be constructed. As the city grows, pollution and traffic congestion become problems. Only the planner who created a balanced environment can succeed in maintaining a healthy, growing metropolis.

The eight scenarios included on the SimCity disk will give you ideas for your own creations. Also, since each of these cities is designed with a fatal flaw or is facing a disaster, you'll be called upon to save the area. Putting out fires in ►

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The 2000 has multitasking abilities, sprites, a graphic co-processor and built-in speech. With keyboard, mouse, joystick,RS232 and Centronics ports, the 2000 is a powerful computer. It has a built-in 3.5" disk drive, mounting locations for two external Amiga floppy disk drives and has an internal option for IBM PC/XT compatibility. Standard RAM is a full MB and is expandable to 9 MB.

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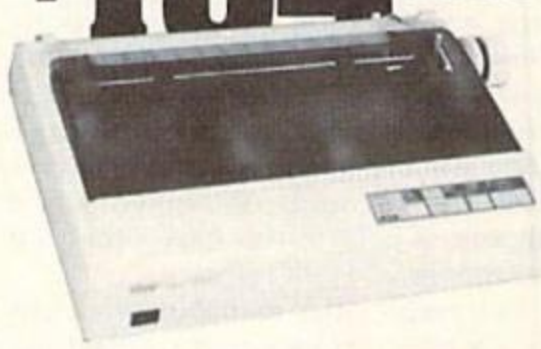

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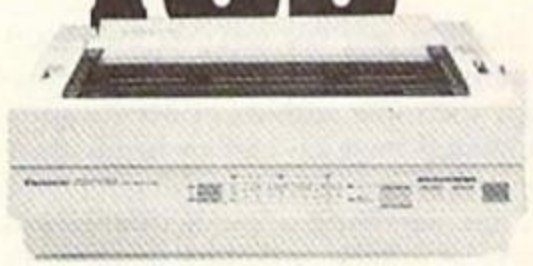

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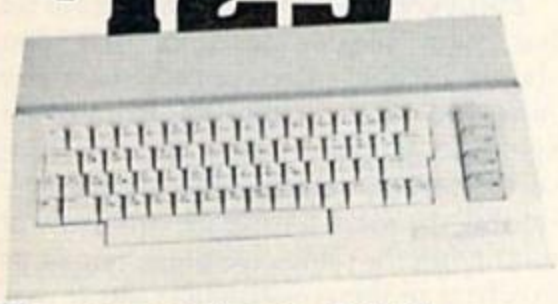

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war-torn Hamburg, clearing out tornado damage in 21st century Boston, or rebuilding Tokyo after Godzilla's visit will challenge even the most expert players.

Additional help comes in the form of a 43-page manual, which contains an easy-to-follow tutorial, detailed descriptions of each screen, menu and scenario, a brief history of cities and city planning and a short bibliography.

SimCity is not without its defects, however. The disk catalog sometimes doesn't list your saved cities, both main maps are incorrectly labelled on the game screen, and building costs are unrealistically computed in terms of thousands of dollars.

Most importantly, the 8-bit, C-64 translation is missing a number of features contained on the 16-bit versions. These include the ability to fight crime, to contain nuclear meltdowns, and to construct more types of buildings. Their absence limits the number of variables present and, consequently, the amount of control you have over your metropolis.

As a result, after managing your city for a while, you may find yourself just sitting back and watching. *(Maxis Software; distributed by Broderbund Software, Inc., 17 Paul Drive, San Rafael, CA 94903. C-64/$29.95.)*

—LEN POGGIALI
SYRACUSE, NY

UNINVITED ..... C+

Do Not Attempt To Adjust Your Monitor Screen...

Daylight and fair weather are death to a mystery/horror game. Not surprisingly then, the authors of Mindscape's Uninvited have chosen to begin their narrative on a stormy night.

After surviving a car accident, you arrive at a dark, brooding mansion in search of your missing brother. There is no one to greet you at the front door, but upon entering, something tells you that you're not alone. Perhaps you have a sixth sense; more likely, you've seen too many cheap horror films or played a game similar to this one.

Before you're through with Uninvited, you must visit dozens of locations, examine and pick up many useful items, solve increasingly difficult puzzles, and cope with innumerable disk loads. Easing your task somewhat is a point-and-click interface accessed either by a Commodore-compatible mouse or joystick.

It was a dark and stormy night in Uninvited.

The game screen consists of a number of windows. In the Command window, items can be examined, doors opened, characters spoken to, and so on, by clicking on the command, moving the cursor to the graphic representation in one of the other windows, and clicking again. Many commands can be activated more easily, simply by going to the Graphic, Exit or Inventory window and double-clicking on the object or location itself.

Pointing to the arrows surrounding the Inventory window and holding down the selection button lets you scroll through all of your possessions. Acquiring new objects is accomplished by dragging them from the graphics screen or Object window to the Inventory window.

Up to ten games can be saved on a single disk side, and these can be loaded at most points in the adventure. Getting killed is particularly annoying, so avoid it if possible. The program takes its time announcing your demise, playing a brief dirge and displaying the figure of death or some other ghoulish image.

Another drawback is your character's inability to travel quickly from location to location. Taking your time is fine when first exploring each room. But later on, when you may want to make a quick getaway, a fast transport feature would be most welcome.

Originally released in the mid-1980s for the Macintosh, Uninvited is showing its age. The graphics, although colorful and generally clear, are nowhere near state-of-the-art for the C-64. Even more problematic is the story. Not only is the subject matter old hat, but the treatment is uninspired. The prose style consists of the usual "frozen with horror" cliches, and, despite the occasional appearance of an unworldly creature, there is little to suggest that this deserted house is possessed of anything more than an incredible number of kitchen cabinets.

With a fine user interface and some intriguing puzzles, Uninvited offers a reasonably worthwhile play value for devotees of the graphic adventure genre. *(Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062. C-64/$34.95.)*

—LEN POGGIALI
SYRACUSE, NY

BATTLES OF NAPOLEON ..... A

A war strategy game/construction set, this program lets you re-create the battles of the greatest general in France's history. You can play one of the four scenarios provided on the two disks or customize them to your own liking. In addition, you can design your own scenarios or have the computer generate new ones.

In Battles of Napoleon, the computer can take both sides, or you can have one or two human opponents play against the computer. Each turn is divided into 25 phases and represents 30 minutes of battle time. After moving leaders and setting objectives (as in all SSI games, there are dozens of options to choose from), you position your units and pick their targets; the computer determines the outcome of the battles. Units advance, retreat, rout. . .back and forth until the end.

Battles of Napoleon's construction set has such flexible features that you should be able to re-create almost any historical conflict situation, from stone age to sci-fi. Determining the structure of the forces, creating the armies, designing the map, setting the squares and modifying the tables are the major steps involved in the construction set. If that seems like a bit much, the computer can take over at any step.

Overall, Battles of Napoleon gives you a very detailed, very good game. And you can be the game designer without having to know programming. It's a must-have for every strategy war gamer. *(Strategic Simulations, Inc., 1046 N. Rengstorff Ave., Mountain View, CA 94043. C-64/$49.95.)*

—GUY WRIGHT

MIND ROLL ..... B+

At first glance, Mind Roll seems to be one of those software programs that are interesting in concept and design, but somewhat lacking in execution. However, the more you play it, the more engrossed you become, and any flaws are soon forgotten.

You must roll a marble through a

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series of ten mazes of varying degrees of difficulty; not as simple as it sounds! There are no maps of the various mazes. Your only recourse in finding your way around is to explore, explore and explore some more.

Each maze has a goal, or exit point. Upon reaching the goal, you accumulate points and advance to that level's master sequence. For example, in level seven, you must pick up items that are scattered about, find keys to open doors and energizers to score points and boosters to increase the time remaining (all mazes are timed).

One of the good points of this game is that you need not master any one level to move on to the next. Each maze is considered a "level" in name only. They can be played in any order, and repeated as often as desired.

Mind Roll is vaguely reminiscent of Electronic Arts' Marble Madness. While both games start from similar points (spheres rolling through mazes), they go in completely different directions. Fans of EA's product will find hours of enjoyment with this Epyx version. *(Epyx, 600 Galveston Drive, Redwood City, CA 94063. C-64/$29.95.)*

—BOB SODARO

JORDAN VS. BIRD: ONE ON ONE ..... C+

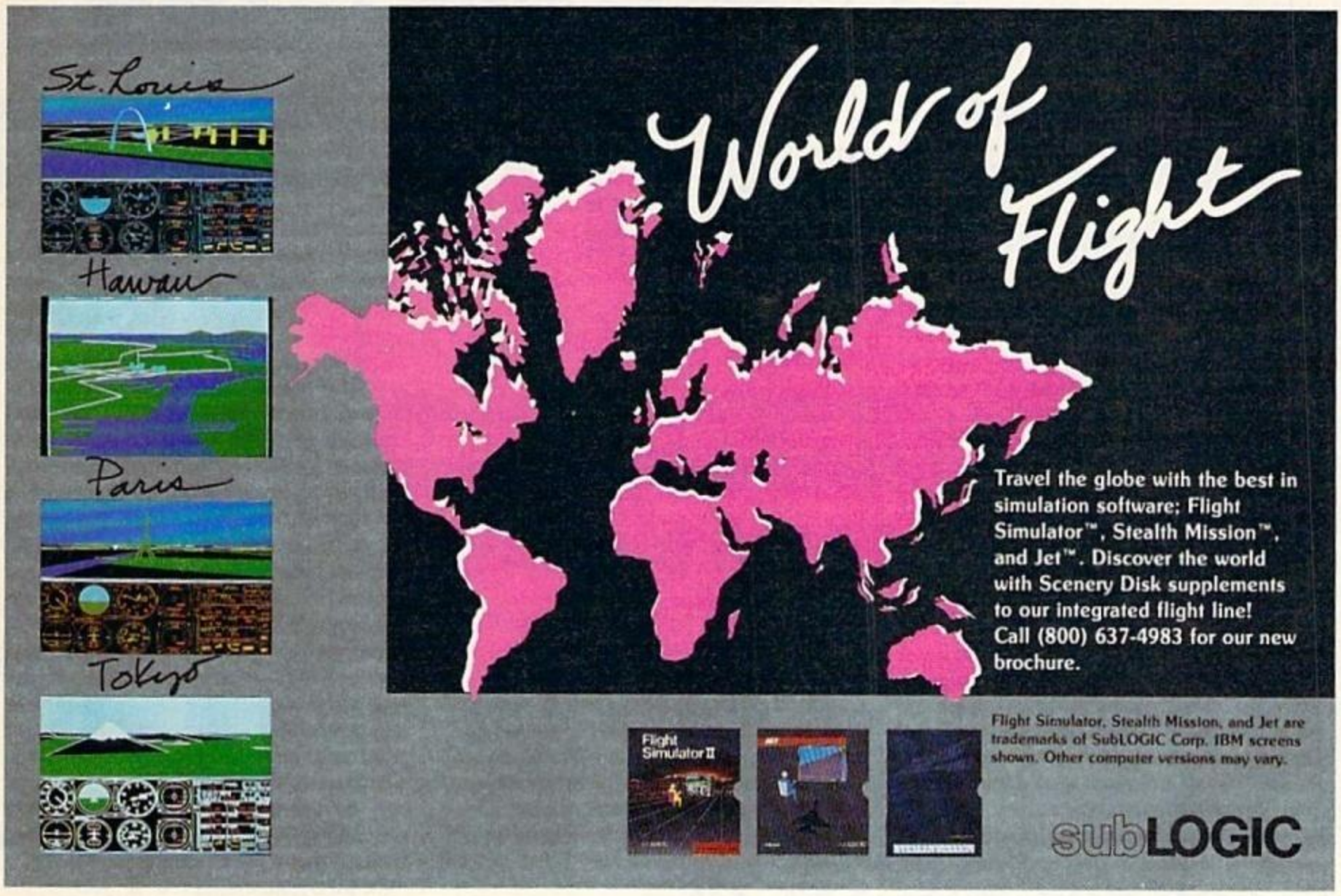
Jordan vs. Bird gives basketball fans the chance to lace on the high-flying sneakers of the Chicago Bulls' guard and the oversized sneakers of the Boston Celtics' great in a half-court game. This latest version of One on One (the original matched Bird against now-retired Philadelphia 76er, Julius Erving) also features a slam-dunk contest and a three-point shootout. Ironically, both Bird and Jordan were injured and couldn't participate in these contests at the most recent NBA all-star game.

Despite these additions, however, Jordan vs. Bird lacks much of the charm of the original One on One. Gone, for instance, is the shattering backboard and the amusing robot who cleaned up the broken glass while chastising the players for their recklessness. Absent are the slow motion instant replays to let you know when your ball-handling dazzled the computer. I even miss the way the referee pointed an accusatory finger when I fouled a player. Finally, there are no time-outs and no fatigue indicators to let you know when your player is getting tired.

Fortunately, the graphics and sound effects have been improved on the new One on One. The players are roughly twice as big and more detailed than in the original, and the court has been expanded and now scrolls horizontally as players move to the left or right of the screen. Joystick control is slightly more complicated.

However, I think that too many of the game's best features have been sacrificed in the upgrade. If you can still find a copy of the old One on One, grab it. It's a classic that's yet to be beat. *(Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/$29.95.)*

—BOB GUERRA ■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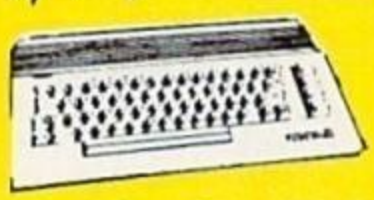

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Sculptor, Lawyer, Editor-in-Chief

RUN's roving reporter has discovered a variety of inventive uses for Commodores, from walking dogs to printing T-shirts.

By LONNIE BROWN

Members of the Commodore community fall into three categories: owners, users and Users. Owners have a computer but seldom turn it on. Regular users, which includes most of us, turn it on but mainly for word processing and playing games. Real Users, on the other hand, squeeze every available byte from memory and press their computer to the limits of its abilities.

Recently, *RUN* asked me to contact some of these Users and find out how they get so much from a Commodore. The answer became clear when I talked to them: They love their machines and know them well. They read Commodore magazines and learn what software and hardware is available; then, once they know what the computer can do, they explore what they can do with it.

Case in point: Clayton "Slim" Johnson is a retired aerospace worker who lives in the small central Florida community of Davenport, south of Walt Disney World. His spare bedroom holds a drafting table, for designing houses, and a C-128. "The old C-64 died one day," Johnson related. "Turned out it was the power supply, although I didn't know it at the time. I bought the 128 the same day the 64 gave out."

Johnson doesn't do anything particularly *unusual* with his computer; it's *how many* things he does with it that's amazing. For starters, he uses an A-B switch box on the computer to select between two printers. One stays loaded with checks for paying bills; the other does a variety of regular printing.

Next to one of the printers sits an X-10 Powerhouse—a device, programmed with the computer, that turns remote switching modules in wall plugs on and off. "You only use the computer to program the main box here. The X-10 also has a battery backup that keeps it going if the power fails, so the house lights don't come on at noon."

When the appropriate appliances are plugged into the modules, the X-10 makes coffee in the morning, starts the lawn sprinklers, turns on the television in the bedroom and turns it off after Johnson falls asleep. "It also turns my Christmas lights on and off," he said.

And it walks his dog, Skeeter! A nightlight by Skeeter's bed comes on about 10:15 PM. If the pooch has already hit the hay, it reminds him to take a trip outside for the evening. "I've got everything but my wife programmed with the computer," joked Johnson, "and I'm working on that."

Johnson's word processor comes in handy for creating text to accompany his house plans. He also wrote a simple program that accepts user input to calculate square footage and estimate construction costs.

Like many of us, Johnson turns out banners and cards with his computer. Unlike most of us, he also makes home-video title screens with it, using the Video Title Shop program from Datasoft.

A peripheral that has added greatly to Johnson's enjoyment of his C-128 is The Quick Brown Box, a programmable memory cartridge that fits into the game port of the machine. He stores often-used programs there, to make them available at a few keystrokes. The cartridge provides 64K of memory, with battery backup so the programs in it aren't lost when the computer is turned off. "It's really a helper," he said. "I use the one from my old C-64, but I want to get the C-128 version for this machine."

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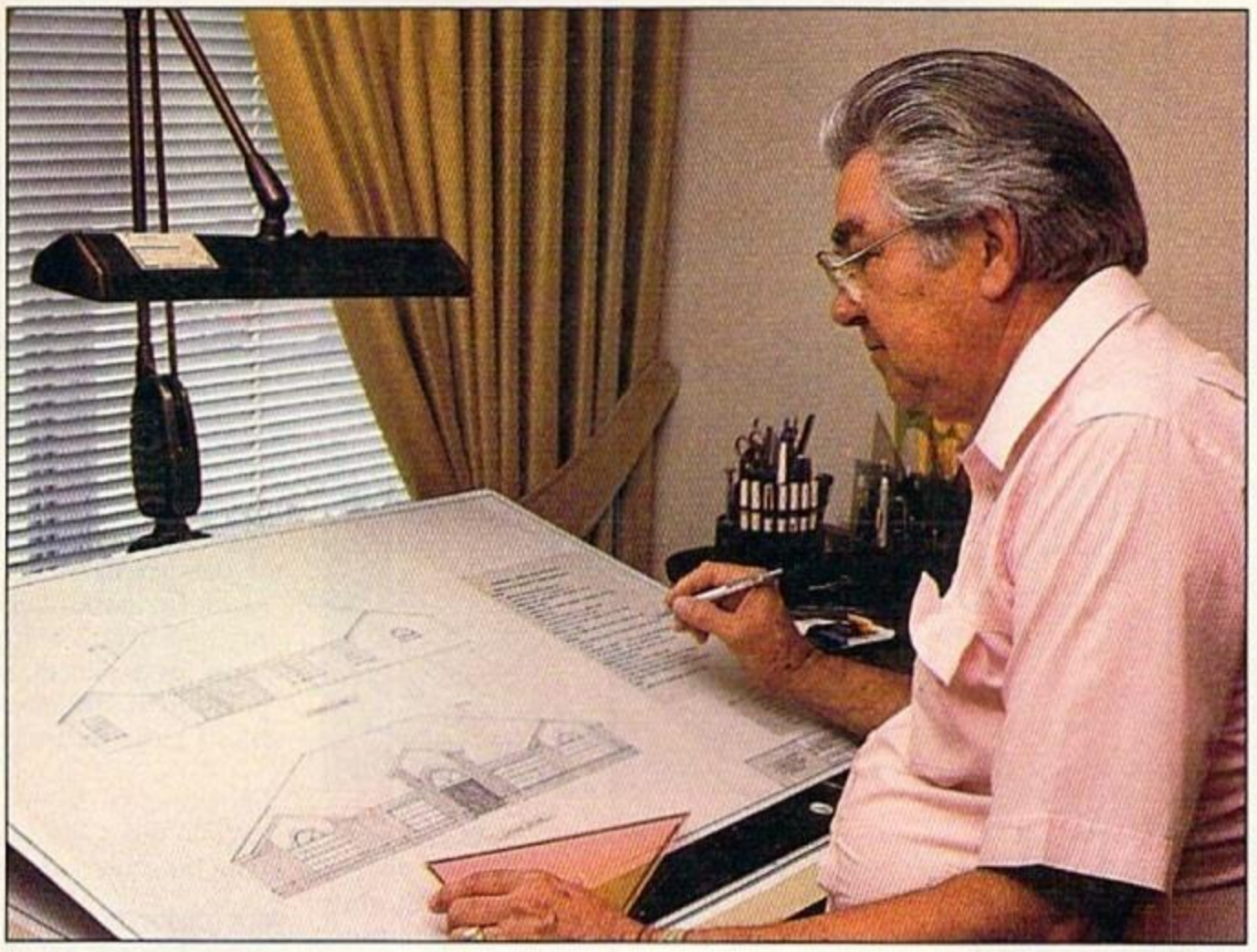


Clayton "Slim" Johnson, of Davenport, Florida, who uses his C-123 for a variety of household tasks, says "People don't realize how versatile these machines are."

Slim Johnson uses his computer for things he never imagined. Sometimes he thinks about getting a bigger and faster machine, "but there's nothing I want to do that I can't do with the C-128. People don't realize how versatile these machines are."

Mashed Turnip

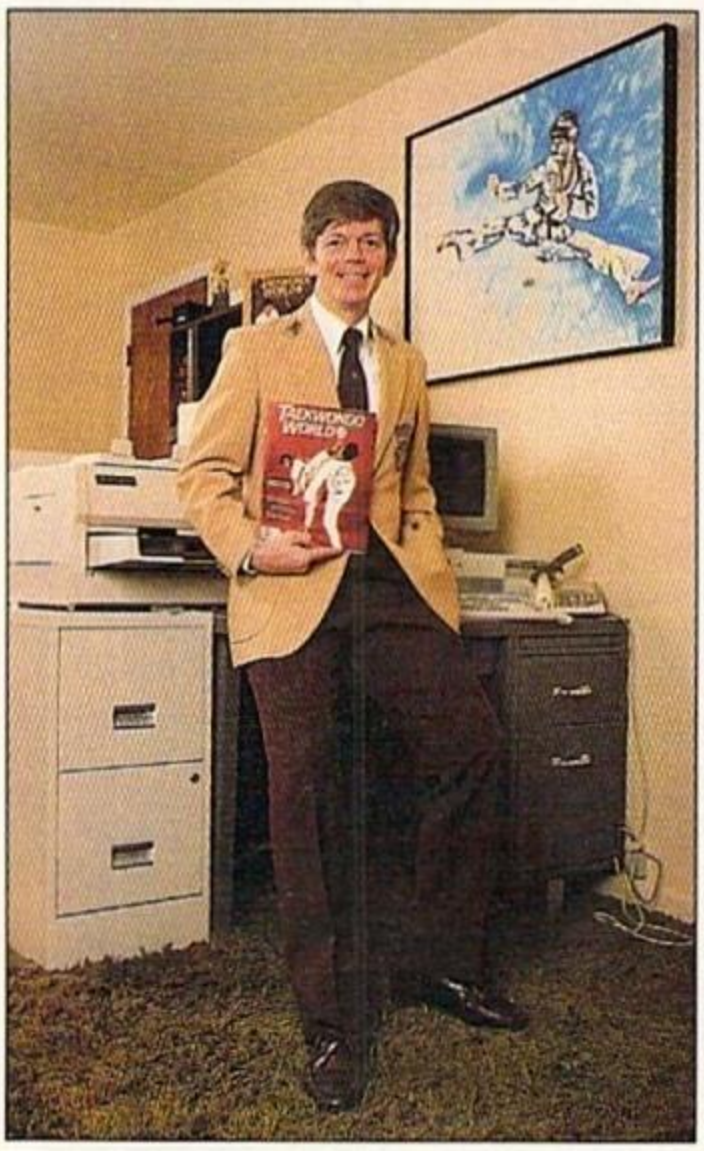
Milo Dailey, editor-in-chief of *Taekwondo World*, used to keep mailing lists for hundreds of subscribers on a C-64. "I was accused of squeezing blood out of a turnip," he related. "That machine was doing things no one thought it could do."

His magazine, a martial arts and fitness publication out of Rapid City, South Dakota, now numbers its subscribers in the tens of thousands and finally outgrew the C-64. However, Dailey quickly pointed out that "the faithful Commodore hasn't been retired yet. My brother-in-law's daughter is using it for school papers."

Dailey looks on the C-64 as an old friend. "I get nostalgic talking about that machine," he said. "The Commodore taught us about computers. Many people are attached to their Commodores, but have you ever heard of anyone getting attached to an IBM clone? If there were an upgrade path from the 64 to an up-to-date professional system, we probably would be using it today instead of the IBM-AT clones."

The Artful User

The day I called, Dale Beach was using his Commodore to print cartoons on transfer paper, so they could be ironed onto T-shirts for a school fund-raising project. He's an artist who has discovered he can use a commercial video digitizer to turn his drawings into printer images.



Milo Dailey, editor-in-chief of *Taekwondo World*: "Many people are attached to their Commodores, but have you ever heard of anyone getting attached to an IBM clone?"

Although Beach has used Commodore computers since the VIC-20 days, he didn't fully ►

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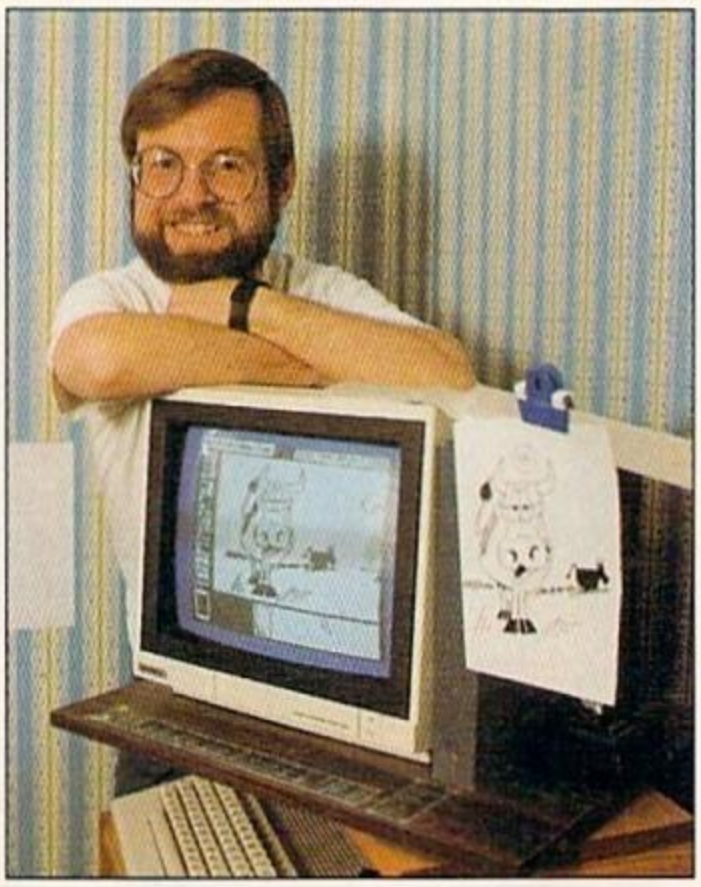


Dale Beach of Elwell, Missouri, credits GEOS with letting him realize the potential of his Commodore for artwork.

appreciate their potential until he started using GEOS for artwork. Now, he publishes a disk of original cartoon art for GEOS users. Another project the Commodore/GEOS combination made possible was a professional-looking, 14-page magazine Beach uses to introduce himself and his artwork to prospective clients.

"After I got a page done with geoPublish, I'd transmit it on QuantumLink to a company called LaserDirect to be laser printed. The service was very reasonable, and it never took more than four days—usually two or three—before I had the finished product in my hands."

He used a copy machine to reduce his cartoons to magazine size, then pasted them on the camera-ready pages. Finally, it was off to the printer. Beach said, "I saved a lot of money by not having my booklet typeset in the normal manner."

It's Legal

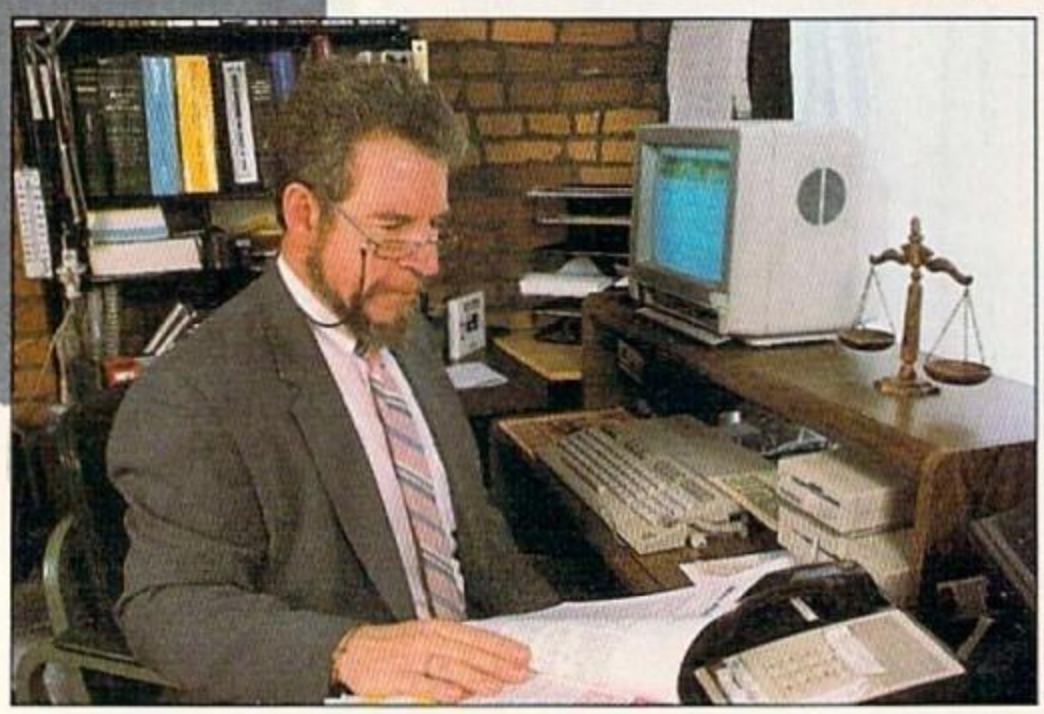
While Dale Beach uses his Commodore for a specific application, Ohio attorney Patrick A. T. West takes a shotgun approach to computer use. The C-128 in his law office is his electronic partner, with Paperback Writer 128 serving as a word processor and SwiftCalc 128 as a spreadsheet. Partner 128 generally increases the computer's productivity.

"If I had to do without all extras but one, I would keep Partner 128," stated West. This plug-in cartridge can get you out of a program you're running and pop up an on-screen menu at the press of a button. Then you can perform various tasks, from typing a quick note to printing out mailing labels to checking a calendar, and return to the program.

"I have no secretary," explained West, who has been using Commodore computers in his practice for over eight years. "With a C-128 and peripherals, I don't need one. I write all my own letters, address all my own envelopes and lick my own stamps."

Indeed, stamp-licking seems to be about the only task West's computer doesn't do. It documents his expenses, tracks his billing, prints out court forms and even helps figure property divisions in bankruptcy and divorce cases.

"I have no secretary," says Ohio attorney Patrick West. "With a C-128 and peripherals, I don't need one."



Music to Their Ears

While one C-128 runs a law office in Columbus, Ohio, two others have generated text and music for a metal-sculpture and computer-art exhibit in Minneapolis, Minnesota. Raymond C. Bryan picked Commodores for his show, not only because of their low price, but, he explained, because "they have good graphics and their mu-

Raymond C. Bryan, shown here with his sculpture, entitled *Aluminum Henge*, put the C-128's graphics and music capabilities to use in a unique art exhibit.

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Computers Making Computers

Using C-64-controlled drilling machines to make printed circuit boards.

By JEFF DYER

MANY PEOPLE THINK OF THE C-64 as just a game machine or a home computer, but that's not the case at Dyer Photographic, a printed circuit board manufacturer in Anderson, Indiana. There the C-64 is at the heart of the automated fabrication process.

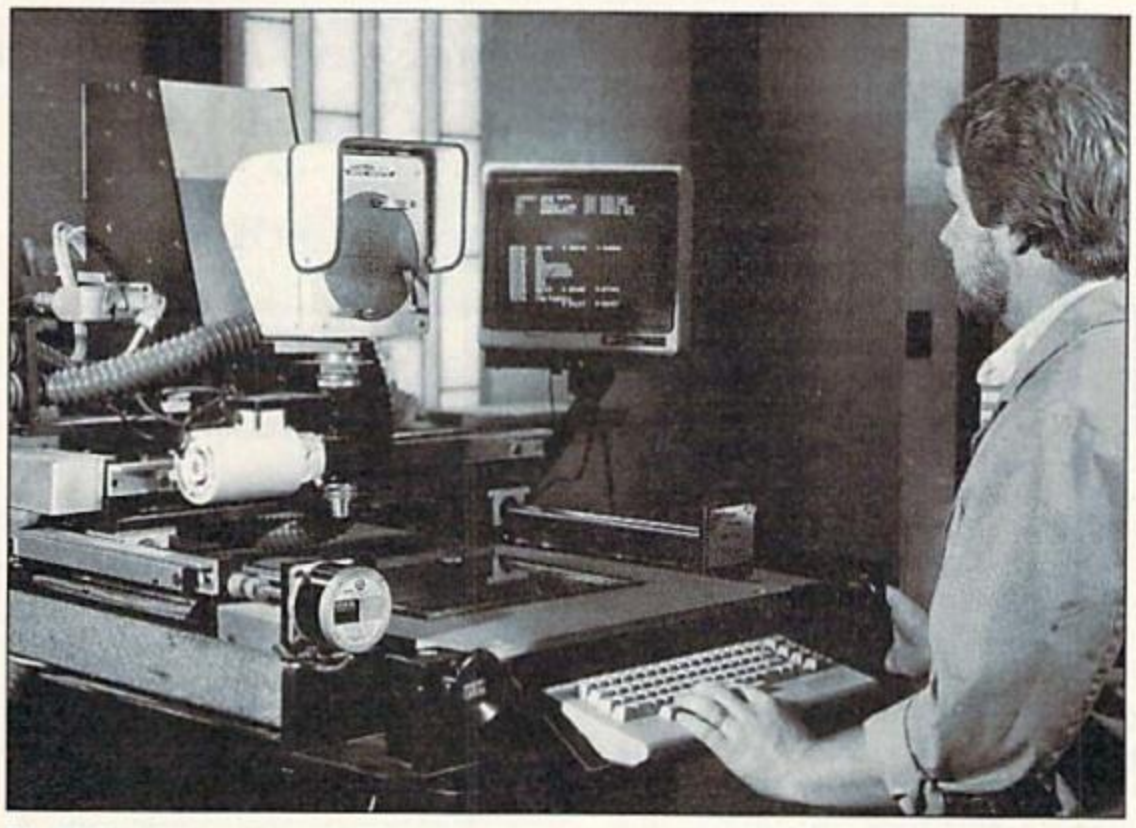
Printed circuit boards, of course, are present in virtually all electronic devices produced in the past 25 years. Computers are prime examples, but they also figure in automobiles, microwave ovens, wrist watches and myriad other devices. Manufacturing the boards is a big business, and automated equipment designed for large-volume production is readily available. However, this type of equipment is inappropriate for prototype and small-volume manufacturers such as Dyer. That's where the C-64 comes in.

A part of the board-manufacturing process that's very well suited to automation is drilling the holes for mounting the electronic components. A board may need from only a few to several thousand holes, and the accuracy and speed of drilling has considerable impact on quality and price.

At Dyer, about 250,000 holes are drilled every day using two Commodore-controlled machines designed and manufactured by Cirtec Systems of Berrien Springs, Michigan. These driller/router machines also rout the board edges.

Before the holes can be drilled, their locations must be entered into the computer, either by hand or automatically. By hand, a Dyer employee places a photo tool (film positive) under a piece of glass, slides it into a ten-power microscope and maneuvers the scope head over the pads where the components will go. When the cross-hairs in the scope intersect at a desired hole location, the employee presses a foot pedal to enter the X and Y coordinates into the C-64. This process is repeated until all the hole locations have been digitized.

In the automatic method, a customer supplies the hole locations already digitized by a computer-aided-design (CAD) program. This data can be entered directly into our machines from punched tape or transferred from an IBM-compatible computer either in IBM format or, via modem, in ASCII format. About a third of our customers provide hole locations in one of these ways.



The C-64 controls the positioning of the hole locations for the drilling process at Dyer Photographic.

The C-64 program that controls the drilling and routing process is well written and easy to use. All options are menu-selected, and a step-and-repeat feature enables us to enter data for a repeated pattern of holes only once, after which we just offset the location to duplicate the pattern.

The version of the program for each board we manufacture is saved to original and backup disks. Then a file card is made up showing the board's part number, the disks where its program is stored and other necessary information. Repeat orders are then easy to process.

The Cirtec machines won't drill as many holes per hour as the big machines generally used in the industry, but they cost less and are easy to maintain. The entire machine is made of off-the-shelf and plug-in parts, and we keep spare C-64s on hand in case of computer trouble. Downtime is measured in minutes, not days. In fact, in the four years we've been using the Cirtecs, they've accumulated less than one day of electronic downtime between them. All things considered, they are perfect for our prototype and small-volume operation. R

Jeff Dyer is President and CEO of Dyer Photographic, Inc., and a part-time instructor in electrical engineering technology.

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sic capabilities weren't available on any other computer in the price range."

Viewers were impressed, but musicians were more impressed. "They were amazed at what computers could do with music," said Bryan, "particularly the smaller-memory machines I was using."

Your C-64 or C-128 has lots of potential, too, especially with the programs and peripherals available. Explore all the possibilities—from educational to occupational to recreational—and don't let the big-boy computers kick sand from Silicon Beach in your Commodore's face.

Editor's note: Can you top this sampling? If you use a C-64 or C-128 in an interesting and unusual way, please write and tell us about it. ■

Lonnie Brown, computer columnist for The Ledger *(Lakeland, FL) and frequent contributor to* RUN, *won the 1988 Software Publisher's Association award for best reporting of computer news.*

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Label Base

Put some zip into your addressing chores with this remarkable mailing-label generator.

By BOB KODADEK

Label Base is an integrated database program for maintaining names, addresses and telephone numbers, with built-in printing routines that let you instantly print both mailing labels, in any quantity, and a personalized telephone directory. Because the program is menu-driven and its files are memory-based, it's fast and easy to move around in, and, since the record format is predefined, you can start inputting your data immediately.

What really sets Label Base apart from many other Basic programs of this type is its use of "pure" sequential files, which means that file data can be exchanged readily between Label Base and some popular programs, such as Superbase. You can even create or edit your files with a word processor that uses sequential files, such as RUN Script.

Best of all, Label Base will run on both a C-64 and a C-128 in either 40- or 80-Column mode with no modifications. In 80 columns, the program automatically takes advantage of the "wider" screen and runs in Fast mode.

Customizing the Program

Begin by typing in Listing 1 in either 64 or 128 mode, using *RUN*'s Checksum program. Save it to disk before running.

Label Base is self-modifying, so the program can be used for both the C-64 and C-128. By default, it operates in Uppercase mode, but you can use lowercase by merely changing PS=0 in line 40 to read PS=7. This affects both screen and printer output. I believe that labels printed in uppercase have a better appearance and are easier to read; also, it's easier and faster to enter data in this mode. However, since this is a matter of personal preference, I feel it's important to have lowercase available.

Label Base is configured to print "one-across" mailing labels of the standard size, which measure $^{15}/_{16}$ of an inch wide by $3^{1}/_{2}$ inches long. If you're using a wider label, you'll need to adjust the amount of vertical space between labels by increasing variable LL in line 40 of the program.

After you've gotten the program working, type in a few sample records, then test for the proper spacing by printing them on a plain sheet of paper and placing the printout next to a strip of your labels for comparison. If the records are too close together, increase LL in line 40 and try again until you achieve the proper positioning of the text. After making this, or any other, change to the program, be sure to save the new version to disk.

Using Label Base

When you run Label Base, it first determines which machine you're using and the number of screen columns available, then appropriately introduces itself as Label Base 64 or Label Base 128 and displays the main menu. If it finds itself in the 80-Column RGBI mode of a C-128, it automatically switches the 8502 processor to 2 MHz and blanks out the composite video screen.

The main menu is shown in Figure 1. To select one of the functions, press the designated function key. At any point in the program, you may return to this main menu by pressing the return key.

The Load, Save, Directory and Alphabetize functions are self-explanatory. Of course, Load and Save actually mean read and write, since Label Base files are sequential.

Note that when it's writing files, the program adds the prefix .LB to each filename. This limits the maximum number of characters in a name to 13, but enables Label Base to distinguish its files from others on the same disk and display only those files when you ask for a directory. When you're reading or writing a file, don't enter the prefix, since the program does it for you. By entering no filename, you can abort a read or write operation without affecting the current file in memory. The error channel is read and reported after each disk operation. To erase the current file in memory and start a new one, press F1 and enter NEW as the filename.

The Enter Data function lets you add new records to a file directly from the main menu. The blank record, or template, is displayed, complete with field names and designated field lengths, so all you have to do is enter the required data into each field and press the return key. The custom input routine automatically limits the amount of data entered.

To correct an error in the current field, use the delete key. To leave a field blank, just press return and move on. After entering the last field, press the space bar to do another record, or press the return key for the main menu. If necessary, records may be further edited from the Select Records menu described below. ►

RUN it right: **C-64 or C-128, in 40- or 80-Column mode; printer**

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While the machine language input routine will accept most characters and punctuation except the quotation mark, it's important not to use commas or colons in your data. If you do, Basic's Input# command will ignore any data after the comma or colon when the file is later read back into memory. While the Get# command will read every byte of data, I found it far too slow for reading large sequential files.

Both the Select Records and Print Menu functions provide submenus to work from.

The Select Records Menu

Whenever you choose Select Records, the current record is displayed on the screen, along with a menu of "quick-key" commands. Control/P instantly prints the current record on as many labels as you indicate; it can be aborted by pressing 0 and return. To find out what the one-letter, quick-key commands do, press ? to go to the Help screen, shown in Figure 2.

The first four one-letter commands instantly locate the First, Next, Previous or Last record in the current file. Key Field Match finds a record by last name, even if you don't remember the correct spelling of the entire name. In most instances, only the first one or two characters will do.

To do a Key Field search, press the K key, and, when prompted for the key field, enter the first portion of the last name and press return. The first record beginning with those characters will appear. Then use the Next Record command to quickly locate the record you want. For this to be effective, the file must be in alphabetical order, so, if necessary, return to the main menu and sort the file by pressing the F4 key.

Figure 1. Main menu.

```
F1 — LOAD FILE
F3 — SAVE FILE
F5 — SELECT RECORDS
F7 — DIRECTORY
F2 — ENTER DATA
F4 — ALPHABETIZE
F6 — PRINT MENU
```

Figure 2. Select Records Help commands.

```
F — FIRST RECORD
N — NEXT RECORD
P — PREVIOUS RECORD
L — LAST RECORD
K — KEY FIELD MATCH
A — ADD RECORD
D — DELETE RECORD
R — REPLACE RECORD
E — EDIT CURRENT RECORD
```

The remaining commands on the Select Records menu let you add new records or delete, replace and edit the current record. When you're editing a record, each field is presented individually. Edit uses Basic's own Input# routine to take data directly from the screen, so all the cursor control keys are functional. However, the Input routine doesn't limit the length of input, so be careful not to enter strings longer than Label Base will allow.

Unlike the C-128's Input# command, the C-64's won't accept an empty string (containing only spaces) from the screen or logical device #1. As a result, when using a C-64, you must represent an empty field with an asterisk on the screen, though it'll be stored as a space character. For this reason, I recommend Edit only for making minor changes to a record. Otherwise, use the Replace command to re-enter the entire contents of the record.

The Print Menu

The Print menu lets you print the current record, all the records in your file or a phone directory of all the records. You'll be prompted for the number of labels you wish to print from each record, the default being 1. If, at this point, you decide not to print a label, enter 0 for the quantity and press return.

All the printing routines check for the presence of a printer with device number 4. If this printer isn't found, the command to print will simply be ignored.

The listings in the phone directory printout are formatted like those in a real phone directory and include no city, state or Zip code. The paging feature in this print routine is based on the normal page length of 66 lines.

The number of files you can input using Label Base is unlimited. However, the maximum number of records per file is 250 for the C-64 and 350 for the C-128. This should be more than enough for the average home computer user.

Even if you're used to another program for printing your labels, try Label Base. It can print a small quantity of labels so fast that you can be finished before a larger database, such as Superbase 128, is done loading. R

Bob Kodadek has been a frequent contributor to RUN *over the years.*

Running Instructions: **Type in the program; save it before running.**

Listing 1. Label Base program. (Available on ReRUN disk. See page 37.)

```
10 REM LABEL BASE 64/128              :REM*206
20 REM BY BOB KODADEK                 :REM*162
30 :                                  :REM*88
40 PS=0:LL=3:Q=250:C=40:MO=64:ML=828:YR=782:PRINT CHR$(142)
                                      :REM*152
50 IF PEEK(40960)=0 THEN MO=128:ML=4864:POKE828,183:IF PEEK(215) THEN C=80 :REM*51
60 SP$=CHR$(32):M$=CHR$(44):IF MO=128 THEN YR=8:Q=350
                                      :REM*240
70 IF C=80 THEN POKE53265,PEEK(53265) AND 239:POKE 53296,1:REM FAST MODE :REM*150
80 B$=CHR$(13)+CHR$(18):O$=CHR$(146):FOR I=0 TO 6:READ FD$(I),L%(I):NEXT :REM*71
90 FOR I=3 TO C:L$=L$+CHR$(163):NEXT:FORI=0 TO 39:E$=E$+SP$:NEXT :REM*65
100 FOR I=0 TO 89:READ BY:POKE ML+I,BY:CK=CK+BY:NEXT:IF PS THEN PRINT CHR$(14)
                                      :REM*139
110 IF CK<>14598 THEN PRINT"DATA ERROR":END :REM*208
120 DIM R$(Q,7),K(Q):FORI=1 TO Q:K(I)=I:NEXT :REM*57
130 :                                 :REM*188
140 REM - MENU 1 -                    :REM*186
150 CLOSE1:CLOSE5:CLOSE15:GOSUB 300:PRINT :REM*134
160 PRINT B$ SPC(5)"F1" O$" - LOAD FILE" :REM*17
170 PRINT B$ SPC(5)"F3" O$" - SAVE FILE" :REM*200
180 PRINT B$ SPC(5)"F5" O$" - SELECT RECORDS" :REM*30
190 PRINT B$ SPC(5)"F7" O$" - DIRECTORY " :REM*194
200 PRINT B$ SPC(5)"F2" O$" - ENTER DATA" :REM*73
210 PRINT B$ SPC(5)"F4" O$" - ALPHABETIZE" :REM*152
220 PRINT B$ SPC(5)"F6" O$" - PRINT MENU" :REM*161
230 GOSUB310:KP=ASC(A$)-132:IF KP<1 OR KP>7 THEN 230
                                      :REM*106
240 ON KP GOSUB430,560,650,1330,980,880,1590 :REM*0
250 GOTO150                           :REM*71
260 :                                 :REM*63
270 X=20:Y=0:GOSUB280:PRINT E$:RETURN :REM*208
```


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LABEL BASE

```
28Ø IF MO=64 THEN POKE781,X:POK
    E YR,Y:POKE783,Ø:SYS6552Ø:R
    ETURN                :REM*232
29Ø POKE7,X:POKE YR,Y:POKE5,Ø:S
    YS6552Ø:RETURN       :REM*172
3ØØ PRINT CHR$(147)" LABEL BASE
    " MO"- FILE: "FS$:PRINT SPC
    (1) L$:RETURN        :REM*252
31Ø A$="":GET A$:IF A$="" THEN
    31Ø                  :REM*34
32Ø RETURN               :REM*2Ø7
33Ø F$="":INPUT F$:LE=LEN(F$):R
    ETURN                :REM*42
34Ø INPUT#15,EN$,EM$,ET$,ES$:EN
    =VAL(EN$):RETURN     :REM*168
35Ø GOSUB27Ø:X=19:Y=Ø:GOSUB28Ø
                         :REM*23Ø
36Ø CLOSE 5:CLOSE 15     :REM*212
37Ø PRINT B$ "DRIVE STATUS:" O$
    +SP$+EN$+M$+EM$+M$+ET$+M$+E
    S$                   :REM*179
38Ø PRINT:PRINT"PRESS RETURN"
                         :REM*182
39Ø GOSUB31Ø:IFA$<>CHR$(13)THEN
     39Ø                 :REM*243
4ØØ RETURN                :REM*28
41Ø :                     :REM*213
42Ø REM - LOAD FILE -     :REM*26
43Ø PRINT:PRINT"LOAD WHICH FILE
    ";:GOSUB33Ø          :REM*89
44Ø IF LE<1 THEN RETURN :REM*56
45Ø IF F$="NEW" THEN NR=Ø:RN=Ø:
    FS$="":RETURN        :REM*197
46Ø OPEN 15,8,15:OPEN 5,8,5,"LB
    ."+F$+",S,R"         :REM*17
47Ø GOSUB34Ø:IF EN<>Ø THEN 35Ø
                         :REM*11Ø
48Ø PRINT:PRINT"READING " F$;:R
    N=1                  :REM*123
49Ø FOR I=RN TO Q:FOR N=Ø TO 6:
    INPUT#5,R$(I,N)      :REM*31
5ØØ IF ST=64 THEN52Ø     :REM*25
51Ø NEXT N:NEXT I        :REM*56
52Ø NR=I:FOR I=1 TO Q:K(I)=I:NE
    XT                   :REM*51
53Ø FS$=F$:GOTO35Ø       :REM*39
54Ø :                    :REM*84
55Ø REM - SAVE FILE -    :REM*196
56Ø PRINT:PRINT"SAVE TO FILENAM
    E";:GOSUB33Ø         :REM*87
57Ø IF LE<1 THEN RETURN:REM*182
58Ø OPEN 15,8,15:PRINT#15,"SØ:L
    B."+F$               :REM*183
59Ø OPEN 5,8,5,"LB."+F$+",S,W":
    GOSUB34Ø             :REM*133
6ØØ PRINT:PRINT"WRITING " F$;:I
    F EN<>Ø THEN35Ø      :REM*23Ø
61Ø FOR I=1 TO NR:FOR N=Ø TO 6:
    IF R$(K(I),N)="" THEN R$(K(
    I),N)=SP$            :REM*255
62Ø PRINT#5,R$(K(I),N):NEXT N:N
    EXT I:GOTO35Ø        :REM*33
63Ø :                    :REM*178
64Ø REM - SELECT RECORDS -
                         :REM*149
65Ø GOSUB1Ø8Ø:GOSUB31Ø   :REM*81
66Ø IF A$=CHR$(13) THEN RETURN
                         :REM*18Ø
67Ø IF A$="F"THEN IF NR THEN RN
    =1                   :REM*176
68Ø IF A$="L"THEN RN=NR:REM*195
69Ø IF A$="R"AND NR THEN GOSUB1
    5ØØ:GOTO65Ø          :REM*39
7ØØ IF A$="P"AND RN>1 THEN RN=R
    N-1                  :REM*137
71Ø IF A$="N"AND RN<NR THEN RN=
    RN+1                 :REM*185
72Ø IF A$="K"THEN GOSUB143Ø
                         :REM*143
73Ø IF A$="D"AND NR THEN GOSUB1
    26Ø:IFRN>NRTHENRN=RN-1
                         :REM*17Ø
74Ø IF A$="A"THEN GOSUB98Ø
                         :REM*73
75Ø IF A$="E"AND NR THEN GOSUB1
    16Ø                  :REM*195
76Ø IF A$=CHR$(16) THEN GOSUB16
    9Ø                   :REM*57
77Ø IF A$="?"THEN GOSUB79Ø
                         :REM*64
78Ø CLOSE4:GOTO65Ø       :REM*136
79Ø GOSUB3ØØ:X=5:Y=8:GOSUB28Ø:P
    RINT"HELP MENU":PRINT
                         :REM*71
8ØØ PRINT SPC(8)"F - FIRST RECO
    RD":PRINT SPC(8)"N - NEXT R
    ECORD"               :REM*92
81Ø PRINT SPC(8)"P - PREVIOUS R
    ECORD":PRINT SPC(8)"L - LAS
    T RECORD"            :REM*247
82Ø PRINT SPC(8)"K - KEY FIELD
    MATCH":PRINT SPC(8)"A - ADD
     RECORDS"            :REM*16Ø
83Ø PRINT SPC(8)"D - DELETE REC
    ORD":PRINT SPC(8)"R - REPLA
    CE RECORD"           :REM*165
84Ø PRINT SPC(8)"E - EDIT CURRE
    NT RECORD"           :REM*168
85Ø GOSUB38Ø:RETURN       :REM*41
86Ø :                    :REM*149
87Ø REM - SORT RECORDS :REM*196
88Ø Y=NR:PRINT:PRINT"SORTING";
                         :REM*251
89Ø Y=INT(Y/2):IFY=ØTHEN RETURN
                         :REM*217
9ØØ J=1:K=NR-Y           :REM*1Ø1
91Ø I=J                   :REM*31
92Ø L=I+Y:PRINT".";:IF R$(K(I),
    Ø)<=R$(K(L),Ø) THEN 94Ø
                         :REM*52
93Ø T=K(I):K(I)=K(L):K(L)=T:I=I
    -Y:IF I>Ø THEN 92Ø   :REM*12
94Ø J=J+1:IF J>K THEN 89Ø
                         :REM*238
95Ø GOTO91Ø               :REM*2
96Ø :                    :REM*249
97Ø REM - ENTRY          :REM*181
98Ø T=NR+1:IF T>Q THEN RETURN
                         :REM*169
99Ø RN=T:NR=T:FLAG=1:FOR I=Ø TO
     6:R$(RN,I)="":NEXT  :REM*4
1ØØØ GOSUB1Ø8Ø:FOR I=Ø TO 6:X=8
    +I:Y=11:GOSUB28Ø:POKE YR,L
    %(I)                 :REM*155
1Ø1Ø SYS ML:C1=PEEK(YR):IF C1=Ø
     THEN R$(RN,I)=SP$:GOTO1Ø3
    Ø                    :REM*212
1Ø2Ø FOR S=1 TO C1:R$(RN,I)=R$(
    RN,I)+CHR$(PEEK(255+S)):NE
    XT S                 :REM*11Ø
1Ø3Ø NEXT I:K(RN)=RN:GOSUB27Ø:Y
    =6:GOSUB28Ø:PRINT"PRESS SP
    ACE BAR FOR ANOTHER"
                         :REM*144
1Ø4Ø GOSUB31Ø:IFA$=SP$ THEN 98Ø
                         :REM*12
1Ø5Ø FLAG=Ø:RETURN        :REM*1Ø2
1Ø6Ø :                    :REM*9Ø
1Ø7Ø REM - DISPLAY RECORD -
                         :REM*119
1Ø8Ø GOSUB3ØØ:X=4:Y=5:GOSUB28Ø:
    PRINT"RECORD #"RN"OF"NR
                         :REM*188
1Ø9Ø X=8:Y=Ø:GOSUB28Ø:FOR I=Ø T
    O 6:LD=36-(24-L%(I))
                         :REM*53
11ØØ PRINT SPC(8-LEN(FD$(I))) F
    D$(I)" < "R$(K(RN),I) TAB(
    LD)">":NEXT          :REM*2Ø
111Ø IF FLAG THEN RETURN
                         :REM*148
112Ø IF FLAG=Ø THEN X=18:Y=8:GO
    SUB28Ø:PRINT "(PRESS CTRL-
    P TO PRINT)"         :REM*6Ø
113Ø X=2Ø:Y=1:GOSUB28Ø:PRINT"SE
    LECT - F, N, P, L, K, A, D
    , R, E, ?"           :REM*45
114Ø RETURN               :REM*7
115Ø :                   :REM*188
116Ø REM - EDIT RECORD{2 SPACEs
    }-                   :REM*15Ø
117Ø GOSUB3ØØ:X=4:Y=5:GOSUB28Ø:
    PRINT"RECORD #"RN"OF"NR
                         :REM*22
118Ø X=8:Y=Ø:GOSUB28Ø:FOR I=Ø T
    O 6                  :REM*235
119Ø IF R$(K(RN),I)="" OR R$(K(
    RN),I)=SP$ THEN R$(K(RN),I
    )="*"                :REM*64
12ØØ PRINT SPC(8-LEN(FD$(I))) F
    D$(I)": "R$(K(RN),I)
                         :REM*6Ø
121Ø PRINT CHR$(145) TAB(1Ø);:O
    PEN1,Ø:INPUT#1,R$(K(RN),I)
                         :REM*82
122Ø IF R$(K(RN),I)="*" THEN R$
    (K(RN),I)=""         :REM*37
123Ø PRINT:CLOSE1:NEXT:RETURN
                         :REM*161
124Ø :                    :REM*23
125Ø REM - DELETE RECORD -
                         :REM*194
126Ø GOSUB27Ø:Y=5:GOSUB28Ø:PRIN
    T"DELETE THIS RECORD? (Y O
    R N)"                :REM*117
127Ø GOSUB31Ø:IF A$<>"Y" THEN R
    ETURN                :REM*184
128Ø FOR N=Ø TO 6:R$(K(RN),N)=R
    $(NR,N):R$(NR,N)="":NEXT
                         :REM*111
129Ø FOR I=1 TO NR:IFK(I)=NR TH
    EN K(I)=K(NR):K(NR)=Ø:NR=N
    R-1:RETURN           :REM*148
13ØØ NEXT:RETURN         :REM*179
131Ø :                    :REM*93
132Ø REM - READ DIRECTORY
                         :REM*3Ø
```


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```
133Ø GOSUB3ØØ:PRINT:PRINT
                          :REM*153
134Ø OPEN15,8,15:OPEN1,8,Ø,"$Ø:
     LB.*":GOSUB34Ø:IFEN<>ØTHEN
     35Ø                  :REM*1Ø4
135Ø N$=CHR$(Ø):GET#1,A$,A$
                          :REM*77
136Ø GET#1,A$,A$:IF A$=""THEN 1
     4ØØ                  :REM*96
137Ø GET#1,A$,C$:PRINT ASC(A$+N
     $)+ASC(C$+N$)*256; :REM*28
138Ø GET#1,A$:IFA$=""THEN PRINT
     :GOTO136Ø            :REM*59
139Ø PRINTA$;:GOTO138Ø    :REM*19
14ØØ GOTO36Ø              :REM*2Ø6
141Ø :                    :REM*185
142Ø REM - KEY STRING -:REM*16Ø
143Ø GOSUB27Ø:Y=6:GOSUB28Ø
                          :REM*84
144Ø PRINT"ENTER KEY -";:INPUTK
     $                    :REM*152
145Ø FOR I=1 TO NR        :REM*2Ø5
146Ø IF K$=LEFT$(R$(K(I),Ø),LEN
     (K$)) THEN RN=I:RETURN
                          :REM*89
147Ø NEXT:RETURN          :REM*86
148Ø :                     :REM*4
149Ø REM - REPLACE RECORD
                          :REM*27
15ØØ GOSUB27Ø:Y=5:GOSUB28Ø:PRIN
     T"REPLACE THIS RECORD? (Y
     OR N)"               :REM*45
151Ø GOSUB31Ø:IF A$<>"Y" THEN R
     ETURN                :REM*73
152Ø FOR I=Ø TO 6:R$(K(RN),I)="
     ":NEXT               :REM*85
153Ø GOSUB1Ø8Ø:FOR I=Ø TO 6:X=8
     +I:Y=11:GOSUB28Ø:POKE YR,L
     %(I)                 :REM*119
154Ø SYSML:C1=PEEK(YR):IF C1=Ø
     THEN R$(K(RN),I)=SP$:GOTO1
     56Ø                  :REM*197
155Ø FOR S=1 TO C1:R$(K(RN),I)=
     R$(K(RN),I)+CHR$(PEEK(255+
     S)):NEXT S           :REM*152
156Ø NEXT I:RETURN        :REM*24
157Ø :                    :REM*9Ø
158Ø REM - PRINT MENU -  :REM*98
159Ø GOSUB3ØØ:PRINT:PRINT
                          :REM*156
16ØØ PRINT B$ SPC(5)"F1" O$" -
     PRINT CURRENT RECORD"
                           :REM*7
161Ø PRINT B$ SPC(5)"F3" O$" -
     PRINT ALL RECORDS":REM*253
162Ø PRINT B$ SPC(5)"F5" O$" -
     PRINT PHONE LIST"  :REM*49
163Ø GOSUB31Ø:IF A$=CHR$(13) TH
     EN RETURN            :REM*64
164Ø KP=ASC(A$)-132:IF KP<1 OR
     KP>3{2 SPACEs}THEN 163Ø
                          :REM*54
165Ø ON KP GOSUB169Ø,18ØØ,185Ø
                          :REM*21
166Ø CLOSE4:GOTO159Ø      :REM*151
167Ø :                    :REM*198
168Ø REM - PRINT RECORD -
                          :REM*36
169Ø CN=1:OPEN4,4,PS:CLOSE4:SS=
     ST:IF SS THEN RETURN
                          :REM*226
17ØØ PRINT:PRINT"HOW MANY LABEL
     S? 1";:INPUT"{3 CRSR LFs}"
     ;CN                  :REM*145
171Ø OPEN4,4,PS:IF CN <1 THEN R
     ETURN                :REM*61
172Ø FOR I=1 TO CN        :REM*156
173Ø PRINT#4,R$(K(RN),1) CHR$(3
     2) R$(K(RN),Ø)       :REM*193
174Ø PRINT#4,R$(K(RN),2):REM*15
175Ø PRINT#4,R$(K(RN),3)","CHR$
     (32) R$(K(RN),4) CHR$(32);
                          :REM*143
176Ø PRINT#4,R$(K(RN),5):REM*8Ø
177Ø FOR S=1 TO LL:PRINT#4:NEXT
      S:NEXT I:RETURN     :REM*1Ø9
178Ø :                    :REM*41
179Ø REM - PRINT ALL RECORDS -
                          :REM*185
18ØØ T=RN:RN=1:GOSUB169Ø:IF CN<
     1 OR SS THEN RETURN
                          :REM*183
181Ø RN=RN+1:GOSUB172Ø:IF RN<NR
      THEN 181Ø           :REM*219
182Ø RN=T:RETURN          :REM*233
183Ø :                    :REM*1Ø3
184Ø REM - PRINT PHONE LIST -
                          :REM*181
185Ø LC=Ø:LF=5:OPEN4,4,PS:CLOSE
     4:IF ST THEN RETURN:REM*24
186Ø OPEN4,4,PS:FOR I=1 TO NR:N
     S=Ø                  :REM*151
187Ø FOR N=Ø TO 2:PRINT#4,R$(K(
     I),N) CHR$(32);      :REM*248
188Ø NS=NS+LEN(R$(K(I),N))+1:NE
     XT N                 :REM*191
189Ø NS=NS+LEN(R$(K(I),6)):ND=7
     9-NS                 :REM*183
19ØØ FOR D=1 TO ND:PRINT#4,"-";
     :NEXT D              :REM*18Ø
191Ø PRINT#4,R$(K(I),6):LC=LC+1
     :IF LC<6Ø THEN 193Ø:REM*54
192Ø FOR LC=Ø TO LF:PRINT#4:NEX
     T LC:LC=Ø            :REM*1ØØ
193Ø NEXT I:RETURN        :REM*143
194Ø :                    :REM*2Ø1
195Ø DATA LAST,15,FIRST,18,STRE
     ET,24                :REM*46
196Ø DATA CITY,24,STATE,2,ZIP,1
     2,PHONE,12           :REM*199
197Ø :                    :REM*235
198Ø DATA 132,252,16Ø,Ø,132,251
     ,24Ø,49,32,228,255,24Ø,251
     ,164,251,2Ø1,13      :REM*82
199Ø DATA 2Ø8,6,169,32,32,21Ø,2
     55,96,2Ø1,2Ø,24Ø,4Ø,196,25
     2,24Ø,231,2Ø1        :REM*83
2ØØØ DATA 32,144,227,2Ø1,34,24Ø
     ,223,2Ø1,161,176,4,2Ø1,128
     ,176,215,153,Ø       :REM*146
2Ø1Ø DATA 1,23Ø,251,32,21Ø,255,
     169,161,32,21Ø,255,169,157
     ,32,21Ø,255,2Ø8      :REM*18Ø
2Ø2Ø DATA 195,192,Ø,24Ø,24Ø,198
     ,251,169,32,32,21Ø,255,169
     ,157,32,21Ø,255      :REM*7
2Ø3Ø DATA 32,21Ø,255,2Ø8,223
                          :REM*197 ■
```

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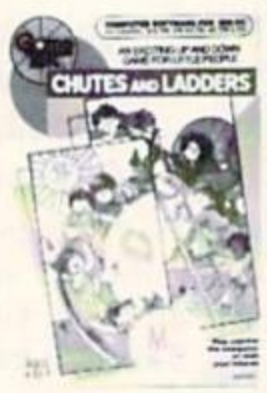

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Journey to the Center Of Your C-128D

This is the third stop on RUN*'s continuing tour of the inside workings of Commodore hardware.*

By ELLEN RULE

Welcome again to *RUN* magazine's Commodore tour bus! This month's excursion will feature yet another of Commodore's computers, the C-128D. There will be some familiar sights for those of you who rode along on the disk drive expedition last April and the C-64/128 tour in December of 1988, but veteran sightseers and newcomers alike will get a scenic view of the 128D's new IC architecture and design.

Most people are leery about opening their computers, and for good reason. Aside from voiding any existing warranty, handling computer components can cause damage from factors such as static electricity. Avoid the risk by hopping aboard our bus; departure time has arrived!

What Meets the Eye

The C-128D is a combination of a C-128 computer and a 1571 disk drive, but with some modifications and upgrades. Like the C-128, the 128D provides 128K of user-accessible memory (which can be increased to 640K with Commodore's 1750 RAM expander), 16 colors and 40- or 80-column composite/RGB output.

The 128D operates in the same three modes as the 128: 64 mode (reached by holding down the Commodore key while booting), native 128 mode and CP/M mode (accessed by turning on the computer with the CP/M boot disk in the drive). In other respects, also, the 128D is much like the 128 and the 1571 drive. Since our prior tours explored those units, our focus on this tour will be on the unique features of the 128D.

The first thing you notice about this machine is that its form differs from the C-128. A detachable keyboard allows freedom of movement, so you can even compute from the comfort of your recliner! If you prefer a desk, the feet at the back of the keyboard can be raised to adjust the keyboard's angle. Despite its new design, the function and layout of the keyboard are identical to those of the C-128.

The broad rectangular case of the 128D houses the computer and disk drive components, including the heretofore separate power supply. With this new design, there's less clutter and tangle of wires on the desktop than with earlier Commodore computers. However, there is a catch: servicing one component puts the whole system in the shop. There's none of the swapping for a "loaner" power supply or disk drive that's possible with a more modular system.

Scouting around the outside of the 128D's housing, we find many familiar ports and sockets. At the rear left is the on/off switch and the power cord connection. Stretching along the back are the familiar user port (for RS-232C interfacing), the RGB connector (for 80-column display), the RF (TV) plug and the TV channel-selection switch. Next come the 8-pin video socket (for 40-column display) and the 6-pin serial port, which allows the coupling of external disk drives and a printer with the computer. At the back right is the expansion port, where cartridges and memory boards such as the 1750 RAM and the Brown Box may be affixed.

Around the corner, on the right side of the case, are the computer and disk drive reset buttons. The drive reset button may be a new feature to you, since it appeared before only on Commodore's SX-64. Pressing this switch has the same effect as turning the disk drive power off and on, with no interruption to the computer power supply. Next in line are the joystick ports (for joystick or mouse) and the 25-pin, D-shaped keyboard connector.

Finally, we come to the cassette port, originally intended for attaching the 1530 Datasette, but now used more frequently for dongles (software protection devices) and printer interfaces (to access the port's 5 volts dc). Because the 128D's case is metal, many users find it necessary to wrap the bare edges of the cassette port opening with nonconductive material, such as electrical tape, to prevent short-circuiting of the computer's ICs by exposed solder joints on components that are plugged in.

The Map of the City

Lifting the lid of the C-128D, we see the disk drive hardware at the right front and the built-in power supply at the back left. These aren't much different from the corresponding parts of the C-128 and 1571, so we won't linger with them. When these components are removed, the computer's motherboard lies before us, its resistors, capacitors, diodes and over 60 integrated circuits resembling a small metropolis. Communication and movement of data takes place along the copper lines of the address, data and control buses.

This city is dominated by the computer circuitry, which occupies the southwest, northwest and northeast corners of the motherboard (looking down on it as you would at a north-oriented map). The disk drive circuitry, a subcity in the southeast, is isolated by a barrier formed of the disk drive's power and data source components (cable connectors, a square, black ac-to-dc rectifier and a blue, barrel-shaped capacitor).

Running parallel to this partition on the west are the 8721 programmable logic array (PLA) and the 8722 memory management unit (MMU). As you may recall from the tour of the C-128, these ICs police the memory resources of the computer and monitor IC selection for operations in the 64, 128 and CP/M modes—complex tasks, indeed!

To the west of the PLA are the central processing plants of the C-128D. First we reach the Z-80, the secondary processor, which makes CP/M operation ►

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C-128D

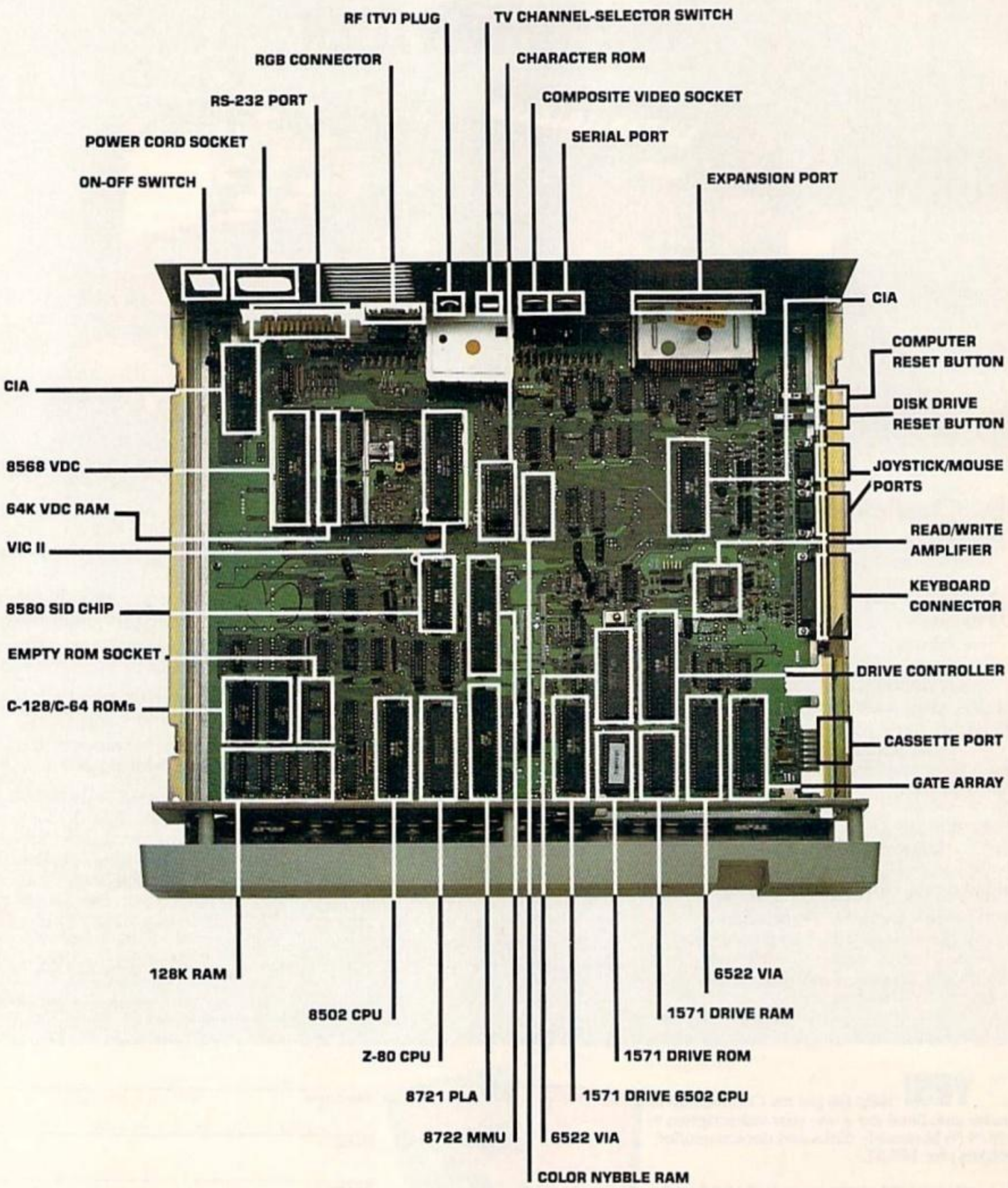

Figure 1. The locations of the principal elements on the C-128D's motherboard.

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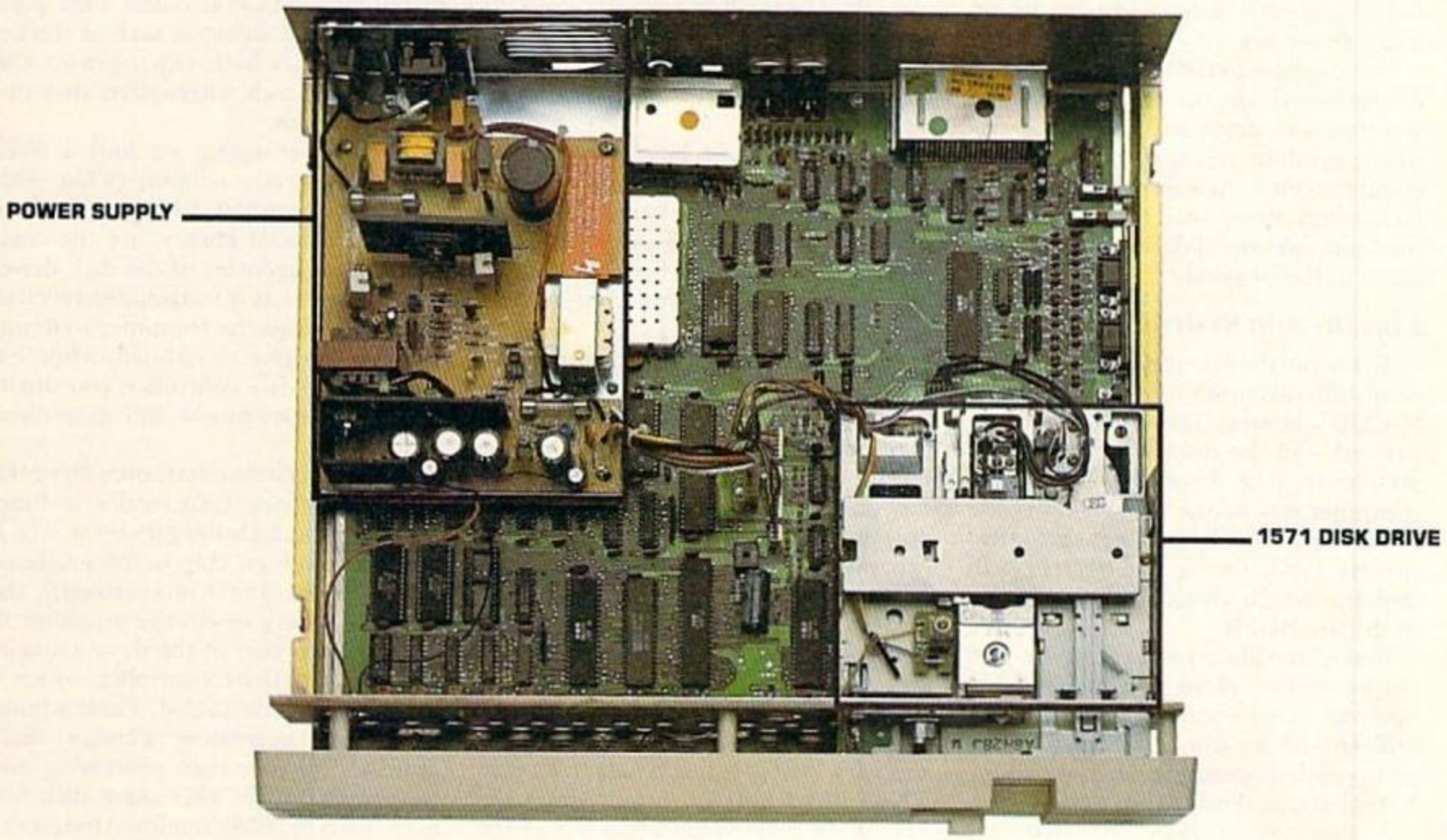

Figure 2. The motherboard with power-supply and disk-drive assemblies in place.

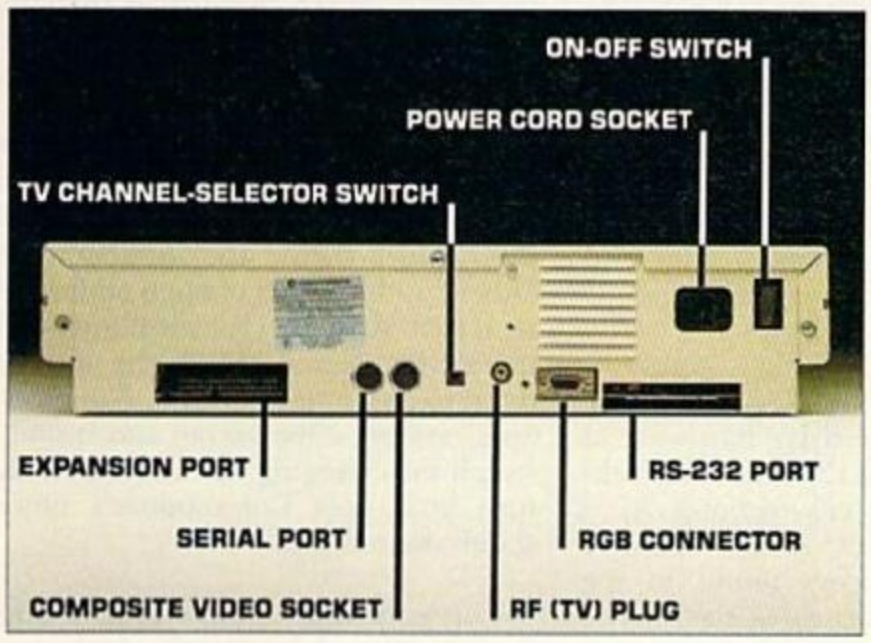

Figure 3. The interface connections on the back of the C-128D.

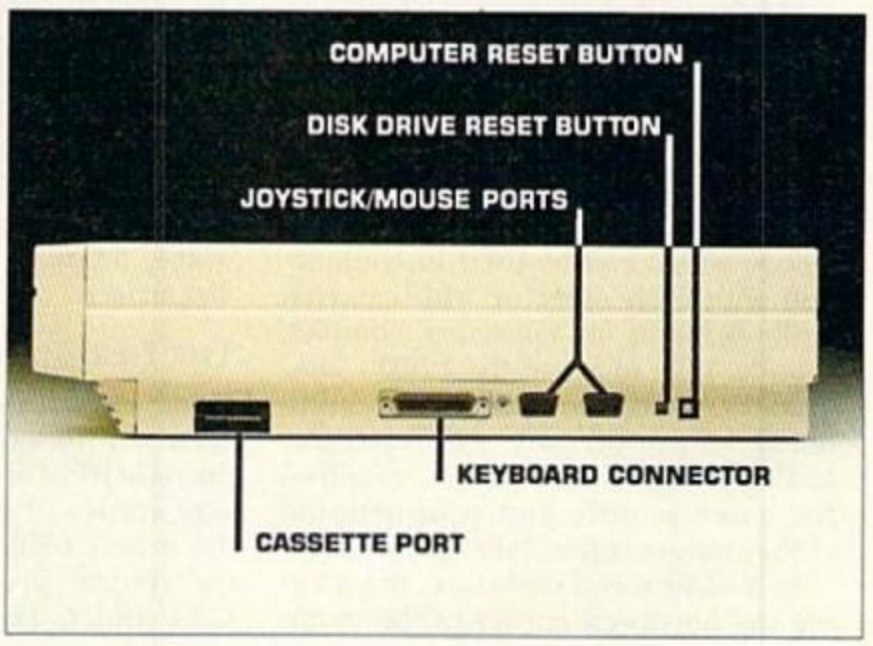

Figure 4. A view of the right-hand side of the C-128D computer.

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possible. Still further to the west lies the 8502 central processing unit (CPU), the brain of both the C-128 and C-128D. Compatible with the earlier CPU of the C-64, the 8502 can interpret C-64 and C-128 software instructions in the 64 and 128 modes.

Moving now to the southwest corner of the board, the 128D's four storage warehouses, providing 128K of dynamic random access memory (RAM), come into view. As a result of enhanced technology, these compact ICs can store the same amount of data as the 16 RAM chips in the original C-128!

Library and Symphony Hall

To the north of the RAMs are two new read-only-memory (ROM) ICs—the C-128D's library. These chips are imprinted with the machine language instructions (the Kernal) that tell the computer how to use the software code it receives. The Basic language interpreters for both the C-64 (Basic 2.0) and the C-128 (Basic 7.0) also reside in the two ROMs.

East of the library is a vacant lot—an empty socket. Here you can plug in optional ICs to provide, for instance, built-in utilities (the 128 Super IC) or an upgraded operating language (Basic 8) that are instantly available for use.

A third ROM chip, the character ROM, stores information for the screen characters. It lies to the north of the MMU, where it's accessed by the 128D's video components and the CPUs.

Just east of the character ROM lies the color nybble RAM, where screen color is stored.

Moving to the northeast, we pass over a number of the small ICs concerned with moving data around in orderly fashion. Then, west of the MMU, we stop at the 8580 SID chip, the symphony orchestra of the 128D. As with the 6581 SID, the 8580 produces three voices, which can be used in conjunction with each other or with external audio sources to construct complex sounds. Like many of the 128D's integrated circuits, the 8580 has an additional chore or two. For example, analog-to-digital conversion, required for game paddle and proportional (1351) mouse input, takes place here.

In a silver metal enclosure, dominating the northwest corner of the motherboard, is the 128D's video production studio. Housed here are the 40- and 80-column video controllers and their helper ICs.

The 8564 VIC II, located on the east side of the video compound, is the same video IC found in the original C-128. Like the earlier 6567 VIC, it provides the computer's 40-column color capabilities, including the hi-res bit-mapped graphics and the sprite action that make Commodore computers so much fun to use. VIC II has other responsibilities, as well, such as generating certain 128-mode timing signals and electronically providing support for the 128D's extended keyboard.

Within the same enclosure is a quartz crystal, the Big Ben of the computer. The oscillation of this system clock produces an absolutely regular tick that keeps the operations of one IC in synchronization with the input/output processes of another.

In the western half of the video enclosure is the 8568 video display controller (VDC), an update of the C-128's 8563 VDC. This IC is responsible for 80-column RGB hi-res (640×200 pixels) and interlaced (640×400) video output. Like its predecessor, the 8568 can produce programmable character fonts and an impressive color graphics display. In addition, the internal workings have been redesigned so as to decrease the part count and enhance system integration.

The VDC uses the 64K of special video memory located immediately to its east. These two RAMs store four times the information the video RAM ICs in the C-128 can. This increased memory allows the VDC to control (and scroll) screens larger than will fit on the monitor, work with 16 colors or more in high resolution and support Basic 8's graphics capabilities.

At the far northwest corner and near the motherboard's eastern border lie the two complex interface adaptors. These CIAs are the Port Authority of the 128D; without them the computer would be unable to communicate with the outside world via its many input/output (I/O) ports, including the keyboard, joysticks, modem, printer and disk drives.

The Disk Drive

The bulk of the circuitry for the disk drive lies under the drive hardware at the right front of the 128D. In the southwest corner of this city-within-a-city is the drive's 6502 CPU. This relative of the central processors found in the C-64 and C-128 provides the drive's "intelligence." In brief, it calls memory addresses within the drive's other ICs, reads data stored there and transmits control signals to memory and I/O components over the copper buses.

East of the 6502 lies the 1571 ROM, the drive's library chip, where the disk operating system (DOS) is stored. The CPU looks here for operating procedures and file-management instructions. Next in the row is the drive's RAM warehouse, where data is temporarily stored during DOS activities. This space is also used by software such as Berkeley's GEOS, which reprograms the drive for its own, alternative, disk operating system.

To the east again, we find a 6522 versatile interface adaptor (VIA). This chip and its partner VIA, just north of the drive's ROM library, are the communication agencies of the disk drive. One VIA acts as a transmitter/receiver station between the computer's circuitry and the drive electronics, while the other is the drive controller, coordinating the stepper motor and movement of the head.

Within the drive electronics, three ICs work closely to perform read/write functions. They include the gate array, which is the 40-pin logic chip in the southeast corner of the 128D motherboard; the spidery-looking read/write amplifier in the northern part of the drive enclave; and the 5710 drive controller, which is north of the drive's RAM. These administrative and regulatory agencies collaborate to enhance data processing and storage; interpret alternative disk formats, such as IBM's modified frequency modulation (MFM); and read and write Commodore's native group-code recording (GCR). The read/write amplifier and the 5710 drive controller are unique to the C-128D.

You might also be interested in the quartz crystal to the west of the 5710. Similar to its counterpart in the computer, this clock produces timing pulses that coordinate activities among the drive's ICs.

Nearby, slightly to the southwest, solder bridges determine the device number of the internal disk drive. Closed, the bridges define the number as 8. Other combinations of open and closed set it to 9, 10 or 11. (For most purposes, there's no reason to set the internal drive to any number but 8. For special applications, a technician can install a switch for changing the number, a feature built into Commodore's newer stand-alone drives.)

This concludes today's tour. I hope you've enjoyed it. Please watch your step when leaving the bus. ■

Ellen Rule is a psychiatric R.N. who finds time not only for extensive user group involvement, but also for a home-based business, Home Computer Resource.

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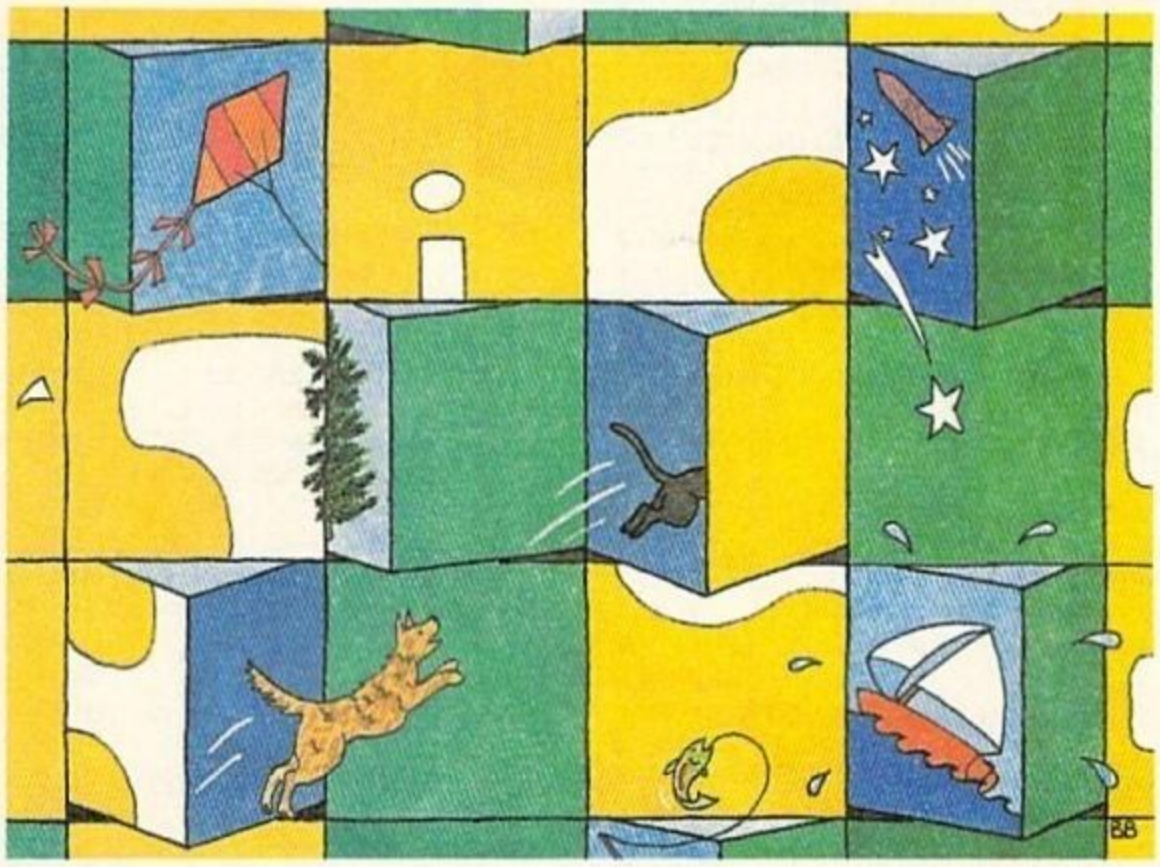
Memory in Motion

Animation brings Concentration to life in this matching game.



By KEN HUEBNER

Memory Tiles is a colorful Concentration-type game for players of ages eight to 80. It shuffles 42 rectangular tiles and displays them on the screen with their backs up. On the "other side" of each tile is a miniature computer picture.

To play, you and a friend take turns moving the cursor around the screen with the cursor keys, searching for matched pairs of pictures. Once you have the cursor over a desired tile, press the space bar, and instantly an animated dog, rocket, Christmas tree or other picture will appear. When the show is over, seek out the matching picture among the other tiles, again by moving the cursor and pressing the space bar. In time, you'll remember the positions of previously shown pictures, making it easier to find matches.

If you make a match, a melodic whistle will tell you to try for another; if you miss, a low beep will signal your opponent to take a turn. The scorekeeper at the bottom of the screen always indicates whose turn it is.

The game is over when all 42 tiles have been matched. If you want to play again—or restart a game—just press the ← key.

When you type in Memory Tiles (Listing 1), use *RUN*'s Checksum program to catch any errors you make and be sure to save it to disk before running it. Here's a tip for typing the multitude of command codes in the Data statements. Pressing the quote key or the space bar lets you access command codes from the Basic text editor, a feature that's especially useful for revising characters in the middle of previously entered lines. Just cursor up to a bad character, insert a space, press the correct character code, space right, backspace and press return.

Now, where *did* I see that other dog? Ⓡ

Ken Huebner is a software designer who runs his own business, called Softrek.

Running Instructions: **Type in Listing 1 and save it to disk before running it.**

Listing 1. Memory Tiles program. (Available on ReRUN disk. See page 37.)

```
10 REM MEMORY TILES      :REM*56
20 REM FILE: "MEMORY"    :REM*78
30 :                     :REM*88
40 W=7:H=6:{5 SPACEs}:REM WID,H
   ITE                   :REM*29
50 CT=W*H{7 SPACEs}:REM TOTAL
                         :REM*23
60 DIM TS(W,H){2 SPACEs}:REM ST
   AT                    :REM*36
70 DIM TT(CT/2) :REM ANIM
                         :REM*218
80 DIM TD$(CT*4):REM IMAGE
                         :REM*17
90 MC=14:DIM TM$(MC)     :REM*220
100 :                    :REM*158
110 REM INIT.GAME        :REM*186
120 POKE53280,3:POKE53281,11
                         :REM*67
130 POKE54296,15         :REM*232
140 FORX=1TOMC:READ TM$(X):NEXT
                         :REM*234
150 DATA "{CTRL 9}{COMD 6}M{3 S
    PACEs}","{CTRL 9}E T ","{CT
    RL 9}M I "           :REM*143
160 DATA "{CTRL 9}O L ","{CTRL
    9}R E ","{CTRL 9}Y S {CRSR
    DN}"                 :REM*12►
```

RUN it right: **C-64**

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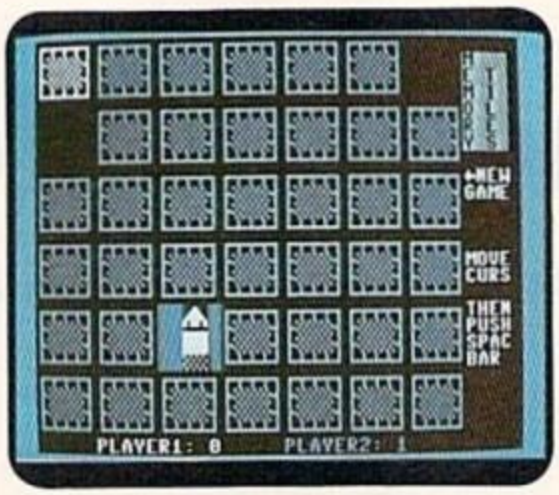
MEMORY

```
17Ø DATA "{CTRL 2}{LEFT ARROW}N
    EW","GAME{3 CRSR DNs}"
                          :REM*21Ø
18Ø DATA "{CTRL 2}MOVE","CURS{C
    RSR DN}","THEN","PUSH","SPA
    C","BAR"              :REM*55
19Ø :                     :REM*248
2ØØ FORY=Ø TO CT/2-1      :REM*2Ø5
21Ø READ V:TT(Y+1)=V      :REM*74
22Ø FORX=Ø TO 7           :REM*1Ø4
23Ø READ A$               :REM*89
24Ø TD$(Y*8+X+1)=A$       :REM*199
25Ø NEXTX:NEXTY           :REM*153
26Ø :                     :REM*63
27Ø REM START GAME        :REM*36
28Ø PRINT"{SHFT CLR}{CTRL 2}":F
    ORY=1TO1Ø:PRINT:NEXT:REM*72
29Ø PRINT TAB(13)"MIXING TILES!
    "                     :REM*244
3ØØ FORY=Ø TO H-1:FORX=Ø TO W-1
                          :REM*181
31Ø TS(X,Y)=Ø:NEXTX:NEXTY{7 SPA
    CEs}:REM CLR.TAB      :REM*33
32Ø FOR V=1 TO CT/2:FOR Z=1TO2
                          :REM*2Ø1
33Ø D=INT(RND(Ø)*CT)      :REM*9
34Ø D=D+1:IF D>=CT THEN D=Ø
                          :REM*113
35Ø Y=INT(D/W):X=D-(Y*W)
                          :REM*246
36Ø IF TS(X,Y)<>Ø THEN 34Ø
                          :REM*41
37Ø TS(X,Y)=V:NEXTZ:NEXTV{7 SPA
    CEs}:REM SET TAB      :REM*124
38Ø :                     :REM*183
39Ø REM DISPLAY GAME      :REM*39
4ØØ PRINT "{SHFT CLR}":SC$="{CT
    RL 4}"                :REM*16Ø
41Ø FOR PY=ØTOH-1:FORPX=ØTOW-1
                          :REM*242
42Ø GOSUB 134Ø            :REM*232
43Ø NEXTPX:NEXTPY         :REM*146
44Ø PRINT "{HOME}"        :REM*85
45Ø FORX=1TOMC:PRINT TAB(35)TM$
    (X):NEXT              :REM*34
46Ø :                     :REM*4
47Ø REM PLAY GAME         :REM*254
48Ø P=1:S1=Ø:S2=Ø:CN=CT:REM*1Ø2
49Ø :                     :REM*38
5ØØ GOSUB 123Ø{3 SPACEs}:REM PL
    AYER                  :REM*116
51Ø GOSUB 1Ø1Ø{3 SPACEs}:REM SE
    LECT                  :REM*2Ø6
52Ø IF K$="{LEFT ARROW}" THEN 2
    7Ø                    :REM*74
53Ø GOSUB 84Ø{3 SPACEs}:REM SHO
    W                     :REM*138
54Ø X2=PX:Y2=PY:T2=TV     :REM*171
55Ø TS(X2,Y2)=-T2         :REM*16
56Ø GOSUB 1Ø1Ø{3 SPACEs}:REM SE
    LECT                  :REM*25
57Ø TS(X2,Y2)=T2          :REM*127
58Ø SF=4:GOSUB145Ø        :REM*6Ø
59Ø GOSUB 84Ø{3 SPACEs}:REM SHO
    W                     :REM*198
6ØØ IFTV=T2 THEN 66Ø      :REM*56
61Ø FORD=1TO35Ø:NEXT      :REM*168
62Ø SC$="{CTRL 4}":GOSUB 131Ø{2
     SPACEs}:REM NORM     :REM*178
```



The tiles you turn jump into action in this memory-testing game.

```
63Ø P=P+1:IFP>2 THEN P=1:REM*29
64Ø GOTO 5ØØ              :REM*199
65Ø :                     :REM*198
66Ø REM MATCHED SQUARE!   :REM*9Ø
67Ø FORSF=2ØTO24Ø STEP 2Ø
                          :REM*91
68Ø GOSUB145Ø:NEXTSF      :REM*224
69Ø TS(X2,Y2)=Ø:TS(PX,PY)=Ø
                          :REM*24Ø
7ØØ SC$="{COMD 4}":GOSUB 131Ø{3
     SPACEs}:REM CLR      :REM*34
71Ø IF P=1 THEN S1=S1+1:REM*119
72Ø IF P=2 THEN S2=S2+1   :REM*84
73Ø CN=CN-2:IF CN>Ø THEN 5ØØ
                          :REM*162
74Ø :                     :REM*29
75Ø REM GAME DONE         :REM*246
76Ø FORSF=22ØTO1Ø STEP-1Ø
                          :REM*1ØØ
77Ø GOSUB144Ø:NEXTSF      :REM*85
78Ø PRINT"{HOME}":FORY=1TO1Ø:PR
    INT:NEXT              :REM*23
79Ø PRINT TAB(15)"{CTRL 2}GAME
    OVER!"                :REM*163
8ØØ GET K$:IFK$<>"{LEFT ARROW}"
     THEN 8ØØ             :REM*98
81Ø GOTO 27Ø              :REM*121
82Ø :                     :REM*1Ø9
83Ø :                     :REM*123
84Ø REM SHOW SQUARE!      :REM*12
85Ø TV=TS(PX,PY)          :REM*187
86Ø TP=(TV)*8-7           :REM*44
87Ø CX=PX*5:CY=PY*4       :REM*212
88Ø D=2ØØ/(TT(TV))        :REM*128
89Ø FOR Z=1 TO TT(TV)/2Ø
                          :REM*191
9ØØ FORX=TP TO TP+4 STEP 4
                          :REM*32
91Ø PRINT"{HOME}";:IF CY=Ø THEN
     93Ø                  :REM*38
92Ø FOR Y=1TOCY:PRINT:NEXTY
                          :REM*51
93Ø PRINTTAB(CX)TD$(X)    :REM*18
94Ø PRINTTAB(CX)TD$(X+1)
                          :REM*225
95Ø PRINTTAB(CX)TD$(X+2):REM*12
96Ø PRINTTAB(CX)TD$(X+3):REM*54
97Ø FOR Y=1 TO D:NEXTY    :REM*127
98Ø NEXTX:NEXTZ           :REM*119
99Ø RETURN                :REM*1Ø4
1ØØØ :                    :REM*38
```

```
1Ø1Ø REM SELECT SQUARE    :REM*91
1Ø2Ø IFPEEK(56321)<255THEN1Ø2Ø
                          :REM*195
1Ø3Ø D=Ø:GETK$:IFK$<>""THEN1Ø2Ø
                          :REM*189
1Ø4Ø YC=INT(D/W):XC=D-(YC*W)
                          :REM*121
1Ø5Ø IF TS(XC,YC)>Ø THEN 1Ø8Ø
                          :REM*149
1Ø6Ø D=D+1:GOTO 1Ø4Ø       :REM*182
1Ø7Ø :                    :REM*1Ø8
1Ø8Ø PX=XC:PY=YC          :REM*242
1Ø9Ø SC$="{CTRL 2}":GOSUB134Ø{4
     SPACEs}:REM SHOW PNT
                          :REM*1ØØ
11ØØ GET K$               :REM*234
111Ø IF K$=" "ORK$="{LEFT ARROW
    }"THEN RETURN         :REM*19
112Ø Z=D                  :REM*236
113Ø IFK$="{CRSR UP}" THEN D=D-
    W:IF D<Ø THEN D=CT+D-1
                          :REM*147
114Ø IFK$="{CRSR DN}"THEN D=D+W
    :IF D>=CT THEN D=D-CT+1
                          :REM*2Ø6
115Ø IFK$="{CRSR LF}"THEN D=D-1
    :IFD<Ø THEN D=CT-1:REM*211
116Ø IFK$="{CRSR RT}"THEN D=D+1
    :IFD>=CT THEN D=Ø :REM*254
117Ø IF D=Z THEN 11ØØ     :REM*1
118Ø YC=INT(D/W):XC=D-(YC*W)
                          :REM*245
119Ø IF TS(XC,YC)<1 THEN 112Ø
                          :REM*51
12ØØ SC$="{CTRL 4}":GOSUB134Ø{4
     SPACEs}:REM MOVE PNT
                          :REM*38
121Ø GOTO 1Ø8Ø            :REM*13
122Ø :                    :REM*25Ø
123Ø REM PRINT PLAYER     :REM*171
124Ø PRINTCHR$(19):FORY=1TO23:P
    RINT"":NEXT           :REM*123
125Ø IFP=1THENPRINT TAB(5)"{CTR
    L 2}PLAYER1:";S1;     :REM*31
126Ø IFP=2THENPRINT TAB(5)"{CTR
    L 4}PLAYER1:";S1;     :REM*161
127Ø IFP=2THENPRINT TAB(2Ø)"{CT
    RL 2}PLAYER2:";S2;:REM*147
128Ø IFP=1THENPRINT TAB(2Ø)"{CT
    RL 4}PLAYER2:";S2;:REM*1Ø5
129Ø RETURN               :REM*157
13ØØ :                    :REM*75
131Ø REM SHOW 2 SQUARES:REM*179
132Ø GOSUB 135Ø           :REM*124
133Ø PX=X2:PY=Y2          :REM*196
134Ø REM SHOW SQUARE      :REM*1ØØ
135Ø CX=PX*5:CY=PY*4      :REM*242
136Ø REM PLOT SQUARE      :REM*145
137Ø PRINT SC$;"{HOME}";:IF CY=
    Ø THEN 139Ø           :REM*2
138Ø FOR Y=1TOCY:PRINT:NEXTY
                          :REM*254
139Ø PRINTTAB(CX)"{COMD A}{3 CO
    MD Rs}{COMD S}"       :REM*156
14ØØ PRINTTAB(CX)"{COMD Q}{3 CO
    MD +s}{COMD W}"       :REM*187
141Ø PRINTTAB(CX)"{COMD Q}{3 CO
    MD +s}{COMD W}"       :REM*177
142Ø PRINTTAB(CX)"{COMD Z}{3 CO
```

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MEMORY

```
    MD Es}{COMD X}"    :REM*102
143Ø RETURN            :REM*34
144Ø :                 :REM*223
145Ø REM SOUND         :REM*5Ø
146Ø POKE54276,32+1    :REM*17Ø
147Ø POKE54273,SF      :REM*186
148Ø POKE54277,2:POKE54278,24Ø+
    8                  :REM*178
149Ø POKE54276,32      :REM*19
15ØØ RETURN            :REM*1Ø8
151Ø :                 :REM*38
152Ø :                 :REM*44
153Ø DATA 2            :REM*231
154Ø DATA "{CTRL 8}{CTRL 9}{SHF
    T LB.}{COMD @} {COMD @}{CO
    MD *}"             :REM*34
155Ø DATA "{CTRL 9} . . "
                       :REM*169
156Ø DATA "{CTRL 9}{2 SPACEs}{S
    HFT S}{2 SPACEs}"  :REM*41
157Ø DATA "{COMD *}{CTRL 9}{SHF
    T J}{SHFT C}{SHFT K}{CTRL
    Ø}{SHFT LB.}"      :REM*151
158Ø :                 :REM*96
159Ø DATA "{CTRL 8}{CTRL 9}{SHF
    T LB.}{SHFT U} {SHFT U}{CO
    MD *}"             :REM*63
16ØØ DATA "{CTRL 9} {SHFT Q} {S
    HFT Q} "           :REM*111
161Ø DATA "{CTRL 9}{2 SPACEs}{S
    HFT S}{2 SPACEs}" :REM*123
162Ø DATA "{COMD *}{CTRL 9}{SHF
    T J}{SHFT W}{SHFT K}{CTRL
    Ø}{SHFT LB.}"      :REM*122
163Ø :                 :REM*158
164Ø DATA 2            :REM*72
165Ø DATA "{CTRL Ø} {COMD 6}{CT
    RL 9}{SHFT LB.}{CTRL 2} {C
    OMD 6}{COMD *}{CTRL Ø} "
                       :REM*142
166Ø DATA "{COMD 6}{CTRL 9}{SHF
    T LB.}{CTRL 2} {SHFT Q} {C
    OMD 6}{COMD *}"    :REM*86
167Ø DATA "{CTRL Ø} {CTRL 9}{CT
    RL 2} {COMD 7} {CTRL 2} {C
    TRL Ø} "           :REM*173
168Ø DATA "{CTRL Ø} {CTRL 9}{CT
    RL 2} {COMD 7} {CTRL 2} {C
    TRL Ø} "           :REM*167
169Ø :                 :REM*21Ø
17ØØ DATA "{CTRL Ø} {COMD 6}{CT
    RL 9}{SHFT LB.}{CTRL 2} {C
    OMD 6}{COMD *}{CTRL Ø} "
                       :REM*248
171Ø DATA "{COMD 6}{CTRL 9}{SHF
    T LB.}{CTRL 2} {SHFT Q} {C
    OMD 6}{COMD *}"    :REM*132
172Ø DATA "{CTRL Ø} {CTRL 9}{CT
    RL 2} {CTRL Ø}{SHFT T}{CTR
    L 9}{CTRL 2} {CTRL Ø} "
                       :REM*128
173Ø DATA "{CTRL Ø} {CTRL 9}{CT
    RL 2} {CTRL Ø}{SHFT T}{CTR
    L 9}{CTRL 2} {CTRL Ø} "
                       :REM*138
174Ø :                  :REM*1
175Ø DATA 8Ø           :REM*81
176Ø DATA "{COMD 3}{CTRL 9}{SHF
    T LB.}{2 SPACEs}{COMD *}{C
    TRL Ø} "           :REM*115
177Ø DATA "{CTRL 9}STOP{CTRL Ø}
     "                 :REM*24Ø
178Ø DATA "{COMD 3}{COMD *}{CTR
    L 9}{2 SPACEs}{CTRL Ø}{SHF
    T LB.} "           :REM*54
179Ø DATA "{CTRL 2}{CTRL Ø} {CO
    MD L}{COMD K}{2 SPACEs}"
                       :REM*2Ø5
18ØØ :                 :REM*69
181Ø DATA "{COMD 3}{CTRL 9}{SHF
    T LB.}{2 SPACEs}{COMD *}{C
    TRL Ø} "           :REM*189
182Ø DATA "{CTRL Ø}{CTRL 2}STOP
     "                 :REM*117
183Ø DATA "{COMD 3}{COMD *}{CTR
    L 9}{2 SPACEs}{CTRL Ø}{SHF
    T LB.} "           :REM*64
184Ø DATA "{CTRL 2}{CTRL Ø} {CO
    MD L}{COMD K}{2 SPACEs}"
                       :REM*26
185Ø :                 :REM*115
186Ø DATA 4Ø           :REM*183
187Ø DATA "{CTRL 9}{COMD 3} {CT
    RL 2} {CTRL 5} {CTRL 8} {C
    OMD 1} "           :REM*118
188Ø DATA "{CTRL 9}{COMD 7} {CO
    MD 6} {CTRL 3} {COMD 8} {C
    TRL 5} "           :REM*41
189Ø DATA "{CTRL 9}{COMD 3} {CO
    MD 7} {CTRL 5} {CTRL 8} {C
    TRL 2} "           :REM*54
19ØØ DATA "{CTRL 9}{CTRL 8} {CT
    RL 4} {CTRL 2} {COMD 6} {C
    TRL 5} "           :REM*17Ø
191Ø :                 :REM*183
192Ø DATA "{CTRL 9}{COMD 7} {CO
    MD 6} {CTRL 3} {COMD 8} {C
    TRL 5} "           :REM*17
193Ø DATA "{CTRL 9}{COMD 3} {CO
    MD 7} {CTRL 5} {CTRL 8} {C
    TRL 2} "           :REM*3Ø
194Ø DATA "{CTRL 9}{CTRL 8} {CT
    RL 4} {CTRL 2} {COMD 6} {C
    TRL 5} "           :REM*146
195Ø DATA "{CTRL 9}{COMD 3} {CT
    RL 2} {CTRL 5} {CTRL 8} {C
    OMD 1} "           :REM*134
196Ø :                 :REM*229
197Ø DATA 2            :REM*145
198Ø DATA "{CTRL 2}{CTRL 9}{SHF
    T LB.}{3 SPACEs}{COMD *}"
                       :REM*229
199Ø DATA "{CTRL 9} {CTRL Ø}RIP
    {CTRL 9} "         :REM*245
2ØØØ DATA "{CTRL 9}{5 SPACEs}"
                       :REM*178
2Ø1Ø DATA "{CTRL 9} 1781"
                       :REM*215
2Ø2Ø :                 :REM*22
2Ø3Ø DATA "{CTRL 2}{CTRL 9}{SHF
    T LB.}{3 SPACEs}{COMD *}"
                       :REM*6Ø
2Ø4Ø DATA "{CTRL 9} BOO!"
                       :REM*236
2Ø5Ø DATA "{CTRL 9}{5 SPACEs}"
                       :REM*252
2Ø6Ø DATA "{CTRL 9} 1781"
                       :REM*26
2Ø7Ø :                 :REM*88
2Ø8Ø DATA 2ØØ          :REM*93
2Ø9Ø DATA "{2 SPACEs}{CTRL 8}{C
    OMD N}{2 SPACEs)" :REM*23Ø
21ØØ DATA " {CTRL 2}{CTRL 9}{SH
    FT LB.}{SHFT Y}{CTRL Ø}{SH
    FT M} "            :REM*11
211Ø DATA "{CTRL 9}{CTRL 2}{SHF
    T LB.} {SHFT Y}{SHFT LB.}{
    COMD *}"           :REM*159
212Ø DATA "{COMD 7}{COMD *}{CTR
    L 9}{2 SPACEs}{SHFT X}{CTR
    L Ø}{SHFT LB.}"    :REM*97
213Ø :                 :REM*132
214Ø DATA "{2 SPACEs}{CTRL 8}{S
    HFT P}{2 SPACEs}"  :REM*3Ø
215Ø DATA " {CTRL 2}{CTRL 9}{SH
    FT LB.}{SHFT Y}{CTRL Ø}{SH
    FT M} "            :REM*121
216Ø DATA "{CTRL 9}{CTRL 2}{SHF
    T LB.} {SHFT Y}{SHFT LB.}{
    COMD *}"           :REM*2Ø9
217Ø DATA "{COMD 7}{COMD *}{CTR
    L 9}{2 SPACEs}{SHFT X}{CTR
    L Ø}{SHFT LB.}"    :REM*83
218Ø :                 :REM*182
219Ø DATA 4            :REM*112
22ØØ DATA "{CTRL 9}{COMD 3}{SHF
    T LB.}{COMD *}{SHFT LB.}{C
    OMD *}{CTRL Ø} "   :REM*196
221Ø DATA "{CTRL 9}LOVE{CTRL Ø}
     "                 :REM*82
222Ø DATA "{COMD *}{CTRL 9}{2 S
    PACEs}{CTRL Ø}{SHFT LB.} "
                       :REM*1Ø7
223Ø DATA " {COMD *}{SHFT LB.}{
    2 SPACEs}"         :REM*69
224Ø :                 :REM*242
225Ø DATA "{CTRL 9}{COMD 3}{SHF
    T LB.}{COMD *}{SHFT LB.}{C
    OMD *}{CTRL Ø} "   :REM*61
226Ø DATA "{CTRL 9} YOU{CTRL Ø}
     "                 :REM*4Ø
227Ø DATA "{COMD *}{CTRL 9}{2 S
    PACEs}{CTRL Ø}{SHFT LB.} "
                       :REM*189
228Ø DATA " {COMD *}{SHFT LB.}{
    2 SPACEs}"         :REM*155
229Ø :                  :REM*37
23ØØ DATA 2            :REM*234
231Ø DATA " {CTRL 6}{COMD *}{CO
    MD 6}{SHFT N}{2 SPACEs}"
                       :REM*183
232Ø DATA "{CTRL 9}{COMD 3}{SHF
    T LB.}({COMD T}{COMD *}{CT
    RL Ø} "            :REM*196
233Ø DATA "{CTRL 9}{3 SPACEs}{C
    TRL 2}{CTRL Ø}) " :REM*197
234Ø DATA "{COMD 3}{COMD *}{CTR
    L 9}{COMD @} {CTRL Ø}{SHFT
     LB.} "            :REM*83
235Ø :                 :REM*97
236Ø DATA " {CTRL 6}{COMD *}{CO
    MD 6}{SHFT N}{2 SPACEs}"
                       :REM*197
237Ø DATA "{CTRL 9}{COMD 3}{SHF
    T LB.}({COMD T}{COMD *}{CT
    RL Ø} "            :REM*61
238Ø DATA "{CTRL 9} {COMD L}{CT ►
```


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MEMORY

```
    RL 2}{SHFT U}{CTRL Ø}{COMD
     J} "                :REM*2Ø2
239Ø DATA "{COMD 3}{COMD *}{CTR
     L 9}{COMD @}{CTRL 2}){CTRL
     Ø}{2 SPACEs}"       :REM*76
24ØØ :                   :REM*147
241Ø DATA 2              :REM*91
242Ø DATA "{CTRL 9}{CTRL 2}2{SH
     FT A}{3 SPACEs}"    :REM*77
243Ø DATA "{CTRL 9}{2 SPACEs}{S
     HFT A}{2 SPACEs}"   :REM*32
244Ø DATA "{CTRL 9}{2 SPACEs}{S
     HFT A}{2 SPACEs}"   :REM*46
245Ø DATA "{CTRL 9}{3 SPACEs}{S
     HFT A}2"            :REM*1Ø8
246Ø :                   :REM*223
247Ø DATA "{CTRL 9}{CTRL 2}2{SH
     FT A} {COMD 7}{COMD *}{CTR
     L Ø} "              :REM*76
248Ø DATA "{CTRL 9}{CTRL 2}{2 S
     PACEs}{SHFT A}{COMD 7}{COM
     D +}{COMD *}"       :REM*28
249Ø DATA "{CTRL 9}{CTRL 2}{2 S
     PACEs}{SHFT A}{2 SPACEs}"
                         :REM*242
25ØØ DATA "{CTRL 9}{3 SPACEs}{S
     HFT A}2"            :REM*19Ø
251Ø :                     :REM*2
252Ø DATA 2ØØ              :REM*3
253Ø DATA "{CTRL 2}{CTRL 9}{2 S
     HFT Qs}{CTRL Ø}{CTRL 8}{CO
     MD +}{SHFT Q}{COMD +}"
                         :REM*144
254Ø DATA "{CTRL 2}{CTRL 9}{5 S
     HFT Qs}"            :REM*217
255Ø DATA "{CTRL 2}{CTRL 9}{SHF
     T Q}{CTRL 8}{COMD +}{CTRL
     Ø}{SHFT Q}{CTRL 9}{COMD +}
     {CTRL 2}{SHFT Q}" :REM*236
256Ø DATA "{CTRL 2}{CTRL 9}{5 S
     HFT Qs}"            :REM*44
257Ø :                   :REM*78
258Ø DATA "{CTRL 2}{CTRL 9}{2 S
     HFT Qs}{CTRL 8}{COMD +}{CT
     RL Ø}{SHFT Q}{CTRL 9}{COMD
      +}"                :REM*118
259Ø DATA "{CTRL 2}{CTRL 9}{5 S
     HFT Qs}"            :REM*1Ø
26ØØ DATA "{CTRL 2}{CTRL 9}{SHF
     T Q}{CTRL 8}{CTRL Ø}{COMD
     +}{SHFT Q}{COMD +}{CTRL 9}
     {CTRL 2}{SHFT Q}" :REM*186
261Ø DATA "{CTRL 2}{CTRL 9}{5 S
     HFT Qs}"            :REM*3Ø
262Ø :                   :REM*124
263Ø DATA 1ØØ            :REM*119
264Ø DATA "{5 SPACEs}"   :REM*72
265Ø DATA "{COMD 7}{4 SPACEs}2"
                         :REM*99
266Ø DATA "{COMD 7}E=MC ":REM*6
267Ø DATA "{5 SPACEs}" :REM*1Ø6
268Ø :                   :REM*184
269Ø DATA "{5 SPACEs}" :REM*118
27ØØ DATA "{CTRL 2}{4 SPACEs}2"
                         :REM*244
271Ø DATA "{CTRL 2}E=MC "
                         :REM*149
272Ø DATA "{5 SPACEs}" :REM*152
273Ø :                   :REM*238
274Ø DATA 2              :REM*144
275Ø DATA "{CTRL 2}SIMON"
                         :REM*243
276Ø DATA "{CTRL 2}SAYS,":REM*9
277Ø DATA "{5 SPACEs}" :REM*198
278Ø DATA "{5 SPACEs}" :REM*22Ø
279Ø :                   :REM*43
28ØØ DATA "{CTRL 2}YOU{2 SPACEs
     }"                  :REM*214
281Ø DATA "{CTRL 2}CAN'T"
                         :REM*2Ø4
282Ø DATA "{CTRL 2}FIND "
                         :REM*85
283Ø DATA "{CTRL 2}IT!{2 SPACEs
     }"                  :REM*15Ø
284Ø :                   :REM*89
285Ø DATA 4Ø              :REM*145
286Ø DATA "{CTRL 2}{5 COMD +s}"
                         :REM*136
287Ø DATA "{CTRL 2}{COMD +}{CTR
     L 9}{3 COMD +s}{CTRL Ø}{CO
     MD +}"              :REM*153
288Ø DATA "{CTRL 2}{COMD +}{CTR
     L 9}{3 COMD +s}{CTRL Ø}{CO
     MD +}"              :REM*147
289Ø DATA "{CTRL 2}{5 COMD +s}"
                         :REM*23Ø
29ØØ :                   :REM*133
291Ø DATA "{CTRL 2}{CTRL 9}{5 C
     OMD +s}"            :REM*166
292Ø DATA "{CTRL 2}{CTRL 9}{COM
     D +}{CTRL Ø}{3 COMD +s}{CT
     RL 9}{COMD +}"      :REM*2
293Ø DATA "{CTRL 2}{CTRL 9}{COM
     D +}{CTRL Ø}{3 COMD +s}{CT
     RL 9}{COMD +}"      :REM*2Ø
294Ø DATA "{CTRL 2}{CTRL 9}{5 C
     OMD +s}"            :REM*132
295Ø :                   :REM*2Ø3
296Ø DATA 2              :REM*123
297Ø DATA "{COMD 3}{CTRL Ø}{2 S
     PACEs}{CTRL 9}{2 COMD *s}{
     CTRL Ø} "           :REM*237
298Ø DATA "{COMD 3}{CTRL Ø} {CT
     RL 9}{SHFT LB.}{CTRL Ø}{SH
     FT Q}{CTRL 9}{SHFT Q}{CTRL
     Ø} "                :REM*58
299Ø DATA "{COMD 3}{CTRL 9}{3 S
     PACEs}{SHFT M}{CTRL 1}{CTR
     L Ø}{SHFT Q}"       :REM*82
3ØØØ DATA "{COMD 3}{CTRL 9}{2 S
     PACEs}{CTRL Ø}{SHFT LB.}{2
      SPACEs}"           :REM*24
3Ø1Ø :                   :REM*247
3Ø2Ø DATA "{COMD 3}{CTRL Ø}{2 S
     PACEs}{CTRL 9}{2 COMD *s}{
     CTRL Ø} "           :REM*223
3Ø3Ø DATA "{COMD 3}{CTRL Ø} {CT
     RL 9}{SHFT LB.}{CTRL Ø}{SH
     FT Q}{CTRL 9}{SHFT Q}{CTRL
     Ø} "                :REM*8
3Ø4Ø DATA "{COMD 3}{CTRL 9}{2 S
     PACEs}{SHFT C}{SHFT I}{CTR
     L 1}{CTRL Ø}{SHFT Q}"
                         :REM*52
3Ø5Ø DATA "{COMD 3}{CTRL 9}{2 S
     PACEs}{CTRL Ø}{SHFT LB.}{2
      SPACEs}"           :REM*42
3Ø6Ø :                   :REM*34
3Ø7Ø DATA 5Ø              :REM*118
3Ø8Ø DATA "{COMD 3} {CTRL 9}{SH
     FT LB.}{CTRL Ø}{CTRL 8}{2
     SHFT LB.s}{COMD 3}{SHFT LB
     .}"                 :REM*2Ø2
3Ø9Ø DATA "{COMD 3}{SHFT LB.}{C
     TRL 8}{CTRL 9}{SHFT LB.} {
     COMD *}{COMD 1}{SHFT LB.}"
                         :REM*44
31ØØ DATA "{CTRL 9}{COMD 7}{2 S
     PACEs}{CTRL 8}{COMD +}{COM
     D 7}{2 SPACEs}"     :REM*33
311Ø DATA "{CTRL 9}{COMD 7}{2 S
     PACEs}{CTRL 8}{COMD +}{COM
     D 7}{2 SPACEs}"     :REM*43
312Ø :                   :REM*1Ø2
313Ø DATA "{COMD 3} {CTRL 9}{SH
     FT LB.}{CTRL Ø}{CTRL 8}{CO
     MD *}{COMD 3}{SHFT LB.}{CO
     MD 3}{COMD *)"      :REM*235
314Ø DATA "{COMD 3}{COMD *}{CTR
     L 8}{CTRL 9}{SHFT LB.} {CO
     MD *}{COMD 1}{COMD *}"
                         :REM*75
315Ø DATA "{CTRL 9}{COMD 7}{2 S
     PACEs}{CTRL Ø}{CTRL 8}{COM
     D +}{COMD 7}{CTRL 9}{2 SPA
     CEs}"               :REM*182
316Ø DATA "{CTRL 9}{COMD 7}{2 S
     PACEs}{CTRL Ø}{CTRL 8}{COM
     D +}{COMD 7}{CTRL 9}{2 SPA
     CEs}"               :REM*14Ø
317Ø :                   :REM*144
318Ø DATA 2              :REM*94
319Ø DATA "{COMD 3}{3 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}"
                         :REM*125
32ØØ DATA "{CTRL 2}{3 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}"
                         :REM*134
321Ø DATA "{COMD 7}{3 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}":REM*93
322Ø DATA "{CTRL 8}{3 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}"
                         :REM*167
323Ø :                   :REM*212
324Ø DATA "{COMD 3}{3 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}"
                         :REM*163
325Ø DATA "{CTRL 2}{SHFT Q}{CTR
     L 6}{2 SHFT Cs}{CTRL 2}{2
     SHFT Qs}"           :REM*7Ø
326Ø DATA "{CTRL 6}{2 SHFT Cs}{
     COMD 7}{3 SHFT Qs}"
                         :REM*1Ø9
327Ø DATA "{CTRL 8}{2 SHFT Qs}{
     CTRL 6}{2 SHFT Cs}{CTRL 8}
     {SHFT Q}"           :REM*61
328Ø :                     :REM*7
329Ø DATA 2ØØ              :REM*3Ø
33ØØ DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{SHFT LB.}{C
     OMD *}{COMD 7} "  :REM*12Ø
331Ø DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{2 COMD Es}{
     COMD 7} "           :REM*45
332Ø DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{2 SPACEs}{C
     OMD 7} "            :REM*1Ø4
```


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MEMORY

```
3330 DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{COMD 3}{2 COMD +s}{
     COMD 7} "          :REM*114
3340 :                  :REM*75
3350 DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{SHFT LB.}{C
     OMD *}{COMD 7} "   :REM*182
3360 DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{2 COMD Es}{
     COMD 7} "          :REM*27
3370 DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL 2}{2 SPACEs}{C
     OMD 7} "           :REM*186
3380 DATA "{COMD 7}{CTRL 9}{2 S
     PACEs}{CTRL Ø}{CTRL 8}{2 C
     OMD +s}{CTRL 9}{COMD 7} "
                        :REM*25
3390 :                  :REM*117
3400 DATA 60            :REM*201
3410 DATA " {COMD 6}{CTRL 9}{SH
     FT LB.}{COMD *}{CTRL Ø}{2
     SPACEs}"           :REM*143
3420 DATA " {CTRL 9}{SHFT Q} {C
     TRL Ø}{2 SPACEs}"  :REM*9
3430 DATA "{CTRL 9}{SHFT LB.} {
     SHFT Q}{COMD *}{CTRL Ø} "
                        :REM*137
3440 DATA " {COMD 3}{COMD M}{CO
     MD J}{2 SPACEs}"   :REM*153
3450 :                  :REM*185
3460 DATA " {COMD 6}{CTRL 9}{SH
     FT LB.}{COMD *}{CTRL Ø}{2
     SPACEs}"           :REM*253
3470 DATA " {CTRL 9}{SHFT W} {C
     TRL Ø}{2 SPACEs}"  :REM*121
3480 DATA "{CTRL 9}{SHFT LB.} {
     SHFT W}{COMD *}{CTRL Ø} "
                        :REM*36
3490 DATA " {COMD 3}{COMD M}{CO
     MD J}{2 SPACEs}"   :REM*175
3500 :                  :REM*235
3510 DATA 40            :REM*62
3520 DATA "{CTRL 9}{COMD 6}$1{3
      SPACEs}"          :REM*88
3530 DATA "{CTRL 9} {CTRL Ø}{SH
     FT LB.}{CTRL 9}{LB.}{CTRL
     Ø}{COMD *}{CTRL 9} "
                        :REM*102
3540 DATA "{CTRL 9}{3 SPACEs}$1
     "                  :REM*115
3550 DATA "{5 SPACEs}"  :REM*199
3560 :                  :REM*44
3570 DATA "{CTRL 9}{COMD 6}$1{3
      SPACEs}"          :REM*150
3580 DATA "{CTRL 9} {COMD *}{LB
     .}{SHFT LB.} "     :REM*209
3590 DATA "{CTRL 9}{3 SPACEs}$1
     "                  :REM*141
3600 DATA "{5 SPACEs}"  :REM*20
3610 :                  :REM*90
3620 DATA 100           :REM*73
3630 DATA "{COMD 7}***{COMD 3}=
     "                  :REM*180
3640 DATA "{COMD 7}***{CTRL 2}=
     "                  :REM*213
3650 DATA "{COMD 3}==== "
                        :REM*35
3660 DATA "{CTRL 2}==== "
                        :REM*132
3670 :                  :REM*158
3680 DATA "{COMD 7}***{COMD 3}=
     ="                 :REM*250
3690 DATA "{COMD 7}***{CTRL 2}=
     ="                 :REM*225
3700 DATA "{COMD 3}====="
                        :REM*76
3710 DATA "{CTRL 2}====="
                        :REM*187
3720 :                  :REM*204
3730 DATA 120           :REM*221
3740 DATA "{CTRL 2}{CTRL 9} C={
     2 SPACEs}"         :REM*28
3750 DATA "{CTRL 9} {CTRL 5}{SH
     FT M} {SHFT M}{CTRL 2} "
                        :REM*10
3760 DATA "{CTRL 9} {CTRL 5} {S
     HFT M} {CTRL 2} "  :REM*106
3770 DATA "{CTRL 9} {SHFT W} {S
     HFT W} "           :REM*32
3780 :                  :REM*240
3790 DATA "{CTRL 2}{CTRL 9} C={
     2 SPACEs}"         :REM*42
3800 DATA "{CTRL 9} {COMD 7} {S
     HFT M} {CTRL 2} "  :REM*136
3810 DATA "{CTRL 9} {COMD 7}{SH
     FT M} {SHFT M}{CTRL 2} "
                        :REM*120
3820 DATA "{CTRL 9} {SHFT W} {S
     HFT W} "           :REM*114
```


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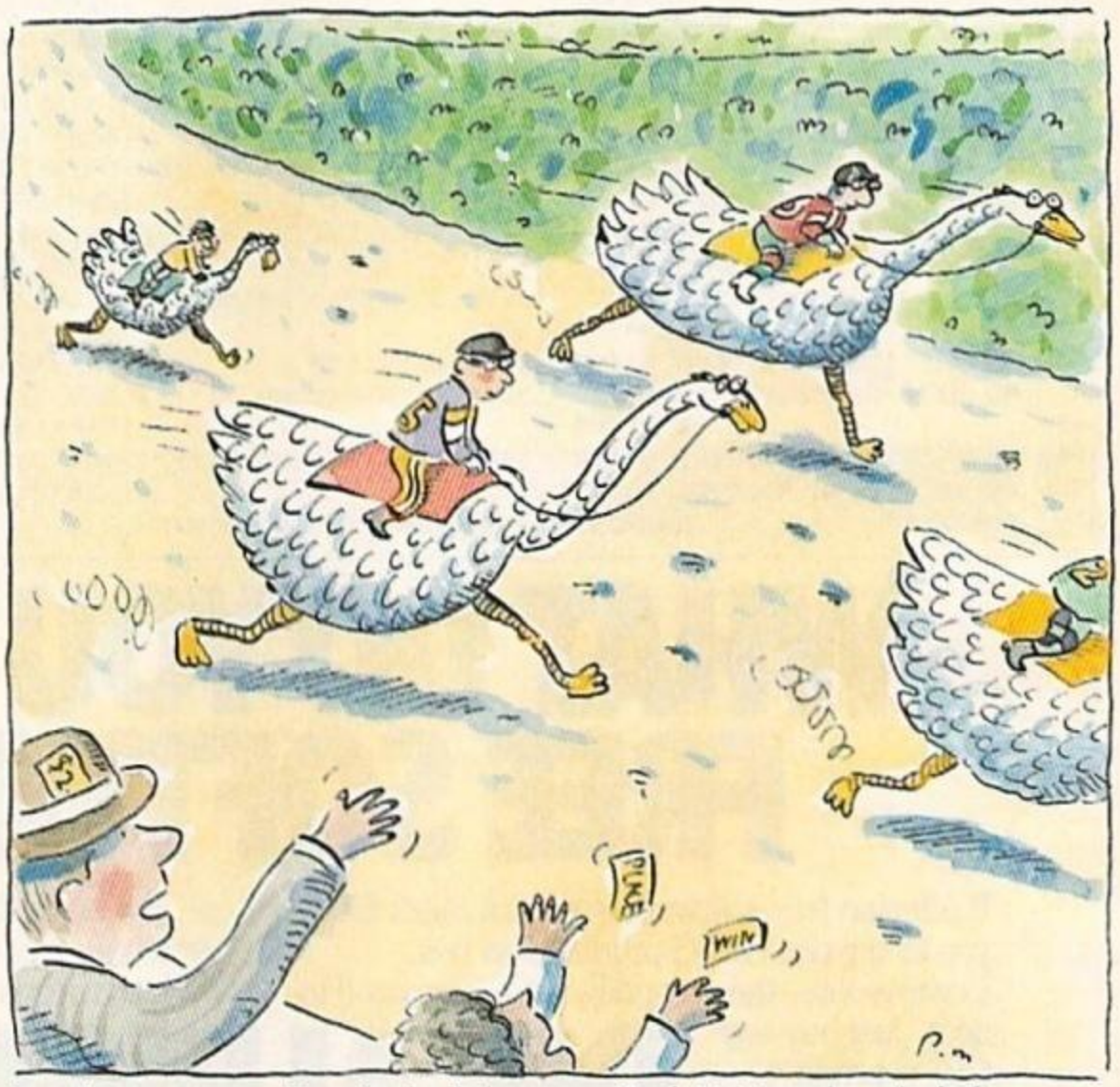
Thoroughbird Racing

Ostriches on the go, to win or place or show, make a fine racing date on your C-128!

By HUGH McMENAMIN



Thoroughbird Racing depicts a racetrack such as you've probably never seen before, since the entrants are two-legged and feathered. That's right; in each race, you bet on your choice among five fleet-footed ostriches, each sporting a jaunty jockey. Wagers of $2–$200 on win, place, show or parlay (win and place) pay 4 to 1, 2 to 1, even and 15 to 1, respectively. Up to eight fans can wager on a race, each starting with a kitty of $200. If Lady Luck has come with someone else, you can always borrow more from the track.

As the afternoon begins, you find yourself at the pari-mutuel window, placing your bet on the first race. The race itself is enlivened by the sound of avian feet pounding the dirt, and it concludes with an official finish photo. Your winnings and the status of your kitty are then shown, along with each bird's record for the afternoon so far.

You and your fellow fans can watch up to ten races in an afternoon, and, when you leave the track, your winnings or losses are displayed. You may want to stick your head in the sand!

Thoroughbird Racing consists of two programs: Thoroughbird Racing proper (Listing 1) and Spritemaker (Listing 2). Spritemaker generates a disk file, entitled Sprites, that the program needs in order to operate. Type in the listings using *RUN*'s Checksum program to ensure accuracy. R

Hugh McMenamin, retired after a career as a physician, is an avid Commodore programmer and, obviously, a race enthusiast.

Listing 1. Thoroughbird Racing program.

```
10 ONAGOTO150           :REM*160
20 FORX=1TO8:SPRITEX,0:NEXT:PRI
   NTCHR$(142)          :REM*10
30 CLR:REM THOROUGHBIRD RACING
   BY HUGH MCMENAMIN    :REM*57
40 B1$="V1T8U9O4SGO5SCSEIGSGSGS
   GIGIESESESEIEICIEICO4IGQRM
                        :REM*95
50 B2$="O4SGO5SCSEIGSGSGSGIGIGI
   EICO4IGSGSGSGIGO5.ICIRM
                        :REM*28
60 C1$="V1T0O4IGIAIGIAIBO5IDIEI
   DIGI#FIAIGI#FIAIGIEIDIDIEIDI
   GIEIDO4IBWAM         :REM*94
70 C2$="V1T8O4QGO5.HC.SDO4.SGO5
   .SDQEQEQE.SE.SF.SC.QEIDQC
                        :REM*77
80 C3$="IDIEIEIDQCIDIEQEIDIEQEI
   CIDQDO4.SA.SA.SAQAQBO5.HCM
                        :REM*13
90 SS=54272:V=53248:RN=1
                        :REM*124
100 FAST:GOSUB2430:GOSUB2240:SL
    OW                  :REM*143
110 FORX=1TO5:READO$(X):NEXT
                        :REM*186
120 TEMPO12:PLAYB1$:PLAYB2$
                        :REM*132
130 PRINTTAB(10)"BY HUGH MCMENA
    MIN"                :REM*201
```

RUN it right: **C-128 (in 40-Column mode)**

ILLUSTRATED BY PAUL MEISEL

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```
14Ø A=1:BLOAD"SPRITES",BØ,P3584
                          :REM*19
15Ø FORI=1TO8:SPRSAVI,A$(I):NEX
    T:SLEEP1              :REM*1Ø5
16Ø BD=8:SX=54296:BC=7 :REM*254
17Ø POKE53281,6:POKE5328Ø,14:PO
    KE646,1               :REM*21Ø
18Ø REM ODDS SCREEN       :REM*56
19Ø PRINT"{SHFT CLR}"TAB(132)"{
    CTRL 2}THOROUGHBIRD":PRINTT
    AB(55)"RACING"        :REM*227
2ØØ PRINTTAB(48);"YOU CAN BET F
    OUR WAYS:             :REM*16Ø
21Ø PRINTTAB(47)"<1> WIN{5 SPAC
    Es}PAYS{2 SPACEs}4 TO 1"
                          :REM*118
22Ø PRINTTAB(7)"<2> PLACE{3 SPA
    CEs}PAYS{2 SPACEs}2 TO 1"
                          :REM*2Ø1
23Ø PRINTTAB(7)"<3> SHOW{4 SPAC
    Es}PAYS{3 SPACEs}EVEN"
                          :REM*166
24Ø PRINTTAB(7)"<4> PARLAY{2 SP
    ACEs}PAYS 15 TO 1" :REM*239
25Ø PRINTTAB(86)"PARLAY - PICK
    WIN AND PLACE         :REM*134
26Ø PRINTTAB(46)"EACH PLAYER IS
     LOANED $2ØØ"         :REM*245
27Ø PRINTTAB(42)"YOU {CTRL 9}MA
    Y{CTRL Ø} BORROW MORE FROM
    THE TRACK             :REM*57
28Ø TEMPO12:PLAYC1$       :REM*233
29Ø SPRSAVA$(6),8:SPRSAVA$(1),7
    :SPRCOLOR2,3          :REM*198
3ØØ MOVSPR8,132,176:MOVSPR7,144
    ,171                  :REM*213
31Ø PRINT"{SHFT CLR}":X=1:EN(X)
    =Ø:GOSUB232Ø          :REM*255
32Ø WINDOWØ,Ø,39,1Ø,1     :REM*248
33Ø SPRITE8,1,8,1,1,1,1:SPRITE7
    ,1,11,1,Ø,Ø:REM BOOKIE
                          :REM*169
34Ø PRINT"{HOME}{CRSR DN}{2 SPA
    CEs}WHAT IS YOUR NAME":NA$=
    ""                    :REM*135
35Ø INPUT"{2 CRSR DNs}{2 SPACEs
    }PIGEON ";NA$(X)      :REM*167
36Ø IFNA$(X)=""ORNA$(X)=" "THEN
    PRINT"{4 CRSR UPs}":GOTO35Ø
                          :REM*191
37Ø FORAN=1TOLEN(NA$(X))
                          :REM*121
38Ø IFASC(MID$(NA$(X),AN,1))=32
    THEN NA$(X)=LEFT$(NA$(X),AN
    ):GOTO4ØØ             :REM*11
39Ø NEXT                  :REM*1Ø
4ØØ IFLEN(NA$(X))>1ØTHENNA$(X)=
    LEFT$(NA$(X),1Ø)      :REM*116
41Ø PRINT"{CRSR DN}{2 SPACEs}AR
    E YOU FEMALE? ";      :REM*2Ø7
42Ø GOSUB216Ø             :REM*244
43Ø IFA$="Y"THEN SE$(X)="MS. ":
    ELSESE$(X)="MR. "     :REM*186
44Ø TA(X)=2ØØ             :REM*224
45Ø WINDOWØ,Ø,39,1Ø,1     :REM*127
46Ø GOSUB48Ø:GOTO83Ø      :REM*92
47Ø GOTO31Ø:GOSUB232Ø     :REM*47
48Ø WINDOWØ,Ø,39,1Ø,1     :REM*153
49Ø SPRITE8,1,8:SPRITE7,1,11:SP
    RSAVA$(6),8:SPRSAVA$(1),7
                          :REM*2Ø9
5ØØ PRINT"{HOME}{CRSR DN}{4 SPA
    CEs}O.K. ";SE$(X);NAME$(X)
                          :REM*242
51Ø PRINT"{CRSR DN}{4 SPACEs}PL
    EASE MAKE A CHOICE (1-5)":O
    $=""                  :REM*1
52Ø INPUT"{CRSR DN}{4 SPACEs}AN
    D ENTER ITS NUMBER ";O$
                          :REM*157
53Ø O(X)=VAL(O$)          :REM*241
54Ø IFO(X)<1THENPRINT"{3 CRSR U
    Ps}":GOTO52Ø          :REM*1Ø7
55Ø IFO(X)>5THENGOSUB58Ø:GOTO52
    Ø                     :REM*127
56Ø IFSE$(X)="MR. "THEN59Ø
                          :REM*2ØØ
57Ø SPRSAVA$(3),7:GOSUB266Ø:GOT
    O59Ø                  :REM*14Ø
58Ø PRINT"{3 SPACEs}THAT NUMBER
     IS TOO BIG TRY AGAIN":RETU
    RN                    :REM*78
59Ø WINDOWØ,Ø,39,1Ø,1:SPRSAVA$(
    2),7                  :REM*116
6ØØ PRINT"{HOME}{6 SPACEs}SELEC
    T TYPE OF BET ?{2 SPACEs}<1
     TO 4>"               :REM*232
61Ø PRINT"{CRSR DN}{6 SPACEs}<1
    >= WIN{9 SPACEs}<2>= PLACE"
                          :REM*164
62Ø PRINT"{CRSR DN}{6 SPACEs}<3
    >= SHOW{8 SPACEs}<4>=PARLAY
    ":A$=""               :REM*16
63Ø GETKEYA$:KI(X)=VAL(A$)
                          :REM*121
64Ø IFKI(X)<1THENPRINT"{4 CRSR
    UPs}":GOTO63Ø         :REM*243
65Ø SPRSAVA$(1),7         :REM*1Ø4
66Ø IFKI(X)>4THENGOSUB58Ø:GOTO6
    3Ø                    :REM*85
67Ø IFKI(X)=4THEN76Ø      :REM*231
68Ø WINDOWØ,Ø,39,1Ø,1     :REM*7Ø
69Ø PRINT"{HOME}{2 CRSR DNs} HO
    W MUCH DO YOU BET? <$2 TO 2
    ØØ>":B(X)=Ø           :REM*47
7ØØ INPUT"{CRSR DN}{4 SPACEs}BE
    T ";B(X)              :REM*67
71Ø IFB(X)<2THENPRINT"{3 CRSR U
    Ps}":GOTO7ØØ          :REM*128
72Ø IFB(X)>2ØØTHENGOSUB58Ø:GOTO
    7ØØ                   :REM*116
73Ø B(X)=INT(B(X)):X=X+1
                          :REM*213
74Ø IFEN(X)>ØTHEN93Ø      :REM*9
75Ø RETURN                :REM*127
76Ø WINDOWØ,Ø,39,1Ø,1     :REM*182
77Ø PRINT"{SHFT CLR}{2 CRSR DNs
    }{2 SPACEs}YOU PICKED NO.";
    O(X);" TO WIN":PL(X)=Ø
                          :REM*74
78Ø INPUT"{CRSR DN}{2 SPACEs}EN
    TER PLACE NUMBER";PL(X)
                          :REM*17Ø
79Ø IFPL(X)<1THENPRINT"{3 CRSR
    UPs}":GOTO78Ø         :REM*143
8ØØ IFPL(X)>5 THENGOSUB58Ø:GOTO
    78Ø                   :REM*88
81Ø IFPL(X)=O(X)THENPRINT"{SHFT
     CLR}{CRSR DN} DUMMY YOU BE
    T ON "O(X)" TO WIN":SLEEP2:
    GOTO77Ø               :REM*221
82Ø GOTO68Ø               :REM*148
83Ø WINDOWØ,Ø,39,1Ø,1     :REM*252
84Ø PRINT"{HOME}{2 CRSR DNs}{2
    SPACEs}ANY MORE PLAYERS? ";
                          :REM*244
85Ø GOSUB216Ø             :REM*152
86Ø IFX>8THEN9ØØ          :REM*253
87Ø IFA$<>"Y"ANDA$<>"N"THENPRIN
    T"{2 CRSR UPs}":GOTO84Ø
                          :REM*126
88Ø IF A$="Y"THEN32Ø      :REM*112
89Ø GOTO92Ø               :REM*2Ø6
9ØØ PRINT"{CRSR DN}{2 SPACEs}SO
    RRY EIGHT IS THE MAXIMUM{2
    SPACEs}NUMBER{6 SPACEs}{CRS ►
```

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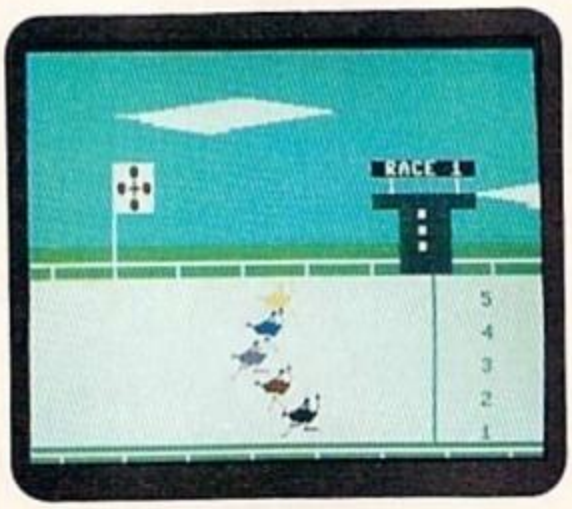
```
    R DN} OF PLAYERS PERMITTED"
                              :REM*14
91Ø SLEEP1                    :REM*48
92Ø EN(X)=1                   :REM*173
93Ø SPRITE7,Ø:SPRITE8,Ø:WINDOWØ
    ,Ø,39,24,1                :REM*154
94Ø FAST:GOSUB244Ø:SLOW:REM TRA
    CK                        :REM*141
95Ø TEMPO12:PLAYB1$           :REM*11Ø
96Ø REM RUN RACE              :REM*73
97Ø SPRITE7,Ø:SPRITE8,Ø:      :REM*1
98Ø FORX=1TO5STEP2:SPRSAVA$(8),
    X:NEXT:FORX=2TO4STEP2:SPRSA
    VA$(7),X:NEXT             :REM*241
99Ø FORX=1TO5:MOVSPRX,Ø,233-X*1
    4:NEXT                    :REM*19Ø
1ØØØ FORX=1TO5:SPRITEX,1,X*2-1,
    1,Ø,Ø,Ø:NEXT:SPRITE5,1,8
                              :REM*57
1Ø1Ø PRINT"{HOME}"TAB(24Ø)TAB(6
    8)"{CTRL 1}{CTRL 9}RACE";R
    N                         :REM*86
1Ø2Ø FORX=1TO5STEP2:SPRSAVA$(BD
    ),X:NEXT:FORX=2TO4STEP2:SP
    RSAVA$(BC),X:NEXT         :REM*82
1Ø3Ø W=INT(RND(1)*5)+1:G(W)=INT
    (RND(1)*3)+1              :REM*97
1Ø4Ø FORI=1TO5:MOVSPRI,+2+G(I),
    +Ø:NEXT                   :REM*35
1Ø5Ø IFPEEK(V+16)<>ØTHENGOTO1Ø8
    Ø                         :REM*86
1Ø6Ø FORJ=5TO15STEP8:POKESX,J:P
    OKESX,P:FORKO=ØTO1Ø:NEXT:N
    EXT                       :REM*115
1Ø7Ø BD=8+(BD=8):BC=7-(BC=7):GO
    TO1Ø2Ø                    :REM*137
1Ø8Ø PRINT"{HOME}{CTRL 1}";:FAS
    T                         :REM*121
1Ø9Ø REM RESULTS              :REM*234
11ØØ FORI=ØTO4:JJ(I)=PEEK(V+I*2
    ):JK(I)=PEEK(V+16)AND2{UP
    ARROW}I                   :REM*174
111Ø IFJK(I)>ØTHENJJ(I)=JJ(I)+2
    55                        :REM*138
112Ø NEXT                     :REM*23Ø
113Ø FORX=1TO14:PRINTG$;:NEXT:F
    ORX=1TO9:PRINTHH$;:NEXT
                              :REM*96
114Ø PRINTG$;"{CTRL 9}{2Ø SPACE
    s}OFFICIAL PHOTO{5 SPACEs}
    {2 HOMEs}":POKE2Ø23,16Ø:PO
    KE56295,Ø                 :REM*128
115Ø PRINT"{HOME}{CTRL 9}{1Ø SP
    ACEs}OFFICIAL RESULTS"
                              :REM*16
116Ø PRINT"{HOME}{CTRL 1}{3 CRS
    R DNs}":PRINTTAB(5)"{CTRL
    9}WIN":PRINTTAB(5)"{CTRL 9
    }PLACE":PRINTTAB(5)"{CTRL
    9}SHOW{CTRL Ø}{HOME}{3 CRS
    R DNs}"                   :REM*197
117Ø J=265:CO=Ø               :REM*148
118Ø FORX=ØTO4:IFJJ(X)=JTHENPRI
    NTTAB(15)"{CTRL 9}";X+1;O$
    (X+1):CO=CO+1:D(CO)=X+1
                              :REM*215
119Ø IFCO=1THENS=D(CO)        :REM*156
12ØØ IFCO=2THENK=D(CO)        :REM*183
121Ø IFCO=3THEND=D(CO):X=4:GOTO
    124Ø                      :REM*8
122Ø NEXT                     :REM*67
123Ø J=J-1:GOTO118Ø           :REM*128
124Ø SLOW                     :REM*36
125Ø GOSUB 217Ø               :REM*58
126Ø FORX=1TO5:SPRITEX,Ø:NEXT
                              :REM*248
127Ø REM PAY OFF              :REM*1Ø4
128Ø PRINT"{SHFT CLR}{2 CRSR DN
    s}":GOSUB232Ø             :REM*8
129Ø WINDOWØ,Ø,39,1Ø,1        :REM*162
13ØØ SPRITE8,1,8,1,1,1,1:SPRITE
    7,1,11,1,Ø,Ø:REM BOOKIE
                              :REM*1Ø2
131Ø GOSUB241Ø:NR=1           :REM*143
132Ø IFEN(NR)=1THEN184Ø:REM END
    FLAG                      :REM*19
133Ø SPRSAVA$(1),7:SPRSAVA$(6),
    8:SPRITE7,1,11            :REM*96
134Ø ONKI(NR)GOTO136Ø,141Ø,145Ø
    ,15ØØ                     :REM*113
135Ø REM WIN                  :REM*158
136Ø IFO(NR)=STHEN138Ø        :REM*24
137Ø GOSUB16ØØ:GOTO156Ø       :REM*82
138Ø B(NR)=(B(NR)*4)          :REM*2
139Ø GOSUB175Ø:GOTO156Ø:REM*1Ø3
14ØØ REM PLACE                :REM*119
141Ø IFO(NR)=SORO(NR)=KTHEN143Ø
                              :REM*142
142Ø GOSUB16ØØ:GOTO156Ø:REM*1Ø8
143Ø B(NR)=(B(NR)*2)          :REM*1Ø4
144Ø GOSUB175Ø:GOTO156Ø:REM*177
145Ø IFO(NR)=SORO(NR)=KORO(NR)=
    DTHEN148Ø                 :REM*97
146Ø GOSUB16ØØ:GOTO156Ø:REM*18Ø
147Ø REM SHOW                 :REM*176
148Ø GOSUB175Ø:GOTO156Ø:REM*217
149Ø REM PARLAY               :REM*115
15ØØ IFO(NR)<>STHEN152Ø:REM*2Ø4
151Ø IFPL(NR)=KTHEN153Ø:REM*136
152Ø GOSUB16ØØ:GOTO156Ø:REM*2ØØ
153Ø B(NR)=INT(B(NR)*15):REM*8Ø
154Ø GOSUB175Ø                :REM*85
155Ø REM MORE RACES?          :REM*232
156Ø NR=NR+1                  :REM*84
157Ø IFNR>8THEN159Ø           :REM*243
158Ø GOSUB241Ø:GOTO132Ø:REM*2Ø2
159Ø GOTO184Ø                 :REM*128
16ØØ IFTA(NR)<B(NR)THEN167Ø
                              :REM*166
161Ø PRINT"{HOME}{CRSR DN}{2 SP
    ACEs}SO SORRY ";SE$(NR);NA
    ME$(NR);" YOU LOSE $";B(NR
    )                         :REM*28
162Ø TA(NR)=TA(NR)-B(NR)
                              :REM*128
163Ø PRINT"{CRSR DN}{3 SPACEs}Y
    OU NOW HAVE $";TA(NR)
                              :REM*79
164Ø SPRSAVA$(2),7:GOSUB267Ø:SL
    EEP1                      :REM*82
165Ø RETURN                   :REM*7
166Ø IFSE$(NR)="MS. "THENSPRSAV
    A$(3)                     :REM*178
167Ø TT(NR)=TA(NR)*-1:TA(NR)=TA
    (NR)-B(NR)                :REM*173
168Ø PRINT"{CRSR DN}{3 SPACEs}H
    EY ";SE$(NR);NAME$(NR);" Y
    OU LOSE AGAIN"            :REM*1Ø1
169Ø TT(NR)=TA(NR)*-1         :REM*199
17ØØ SPRSAVA$(4),7:SPRSAVA$(5),
    8:SPRITE7,1,5             :REM*232
171Ø PRINT"{CRSR DN}{3 SPACEs}Y
    OU OWE THE TRACK $";TT(NR)
                              :REM*75
172Ø PRINT"{CRSR DN}{3 SPACEs}P
    LEASE DON'T EVEN THINK{17
    SPACEs}{CRSR DN}ABOUT LEAV
    ING TOWN"                 :REM*22Ø
173Ø GOSUB221Ø                :REM*244
174Ø RETURN                   :REM*93
175Ø TA(NR)=TA(NR)+B(NR):REM*15
176Ø PRINT"{HOME}{CRSR DN}{2 SP
    ACEs}SO OK{2 SPACEs}";SE$(
    NR);NAME$(NR);" YOU WIN !!
    ";B$                      :REM*137
177Ø IFTA(NR)<ØTHEN169Ø       :REM*33
178Ø PRINT"{CRSR DN}{2 SPACEs}Y
    OU NOW HAVE $";TA(NR)
                              :REM*227
179Ø IFSE$(NR)="MR. "THEN181Ø
                              :REM*184
18ØØ GOSUB222Ø:GOTO183Ø:REM*23Ø
181Ø SPRSAVA$(4),7            :REM*242
182Ø POKESS+24,15:SOUND3,9ØØ,6Ø
    ,2,4ØØ,5Ø,2,2Ø48:SLEEP1
                              :REM*98
183Ø RETURN                   :REM*179
184Ø GOSUB217Ø                :REM*138
185Ø FORI=1TO8:SPRITEI,Ø:NEXT
                              :REM*86
186Ø WINDOWØ,Ø,39,24,1        :REM*61
187Ø POKE53281,6:POKE5328Ø,14:P
    OKE646,1                  :REM*23
188Ø FAST:PRINT"{SHFT CLR}"
                              :REM*172
189Ø L(K)=L(K)+1:U(D)=U(D)+1:W(
    S)=W(S)+1                 :REM*53
19ØØ PRINTTAB(133);"PAST RECORD
    S{4 CRSR DNs}"            :REM*31
191Ø PRINT"{6 SPACEs}NO:1 ";W(1
    );"WIN";L(1);"PLACE";U(1);
    "SHOW{CRSR DN}"           :REM*196
192Ø PRINT"{6 SPACEs}NO:2 ";W(2
    );"WIN";L(2);"PLACE";U(2);
    "SHOW{CRSR DN}"           :REM*114
193Ø PRINT"{6 SPACEs}NO:3 ";W(3
    );"WIN";L(3);"PLACE";U(3);
    "SHOW{CRSR DN}"           :REM*225
194Ø PRINT"{6 SPACEs}NO:4 ";W(4
```



Sometimes a bird wins by a beak.

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```
    );"WIN";L(4);"PLACE";U(4);
    "SHOW{CRSR DN}"     :REM*17
195Ø PRINT"{6 SPACEs}NO:5 ";W(5
    );"WIN";L(5);"PLACE";U(5);
    "SHOW{CRSR DN}":SLOW
                        :REM*123
196Ø PLAYC1$            :REM*229
197Ø IFRN>9THENPRINT"{SHFT CLR}
    {5 CRSR DNs}{7 SPACEs}THE
    RACES ARE OVER":SLEEP2:GOT
    O2Ø1Ø               :REM*161
198Ø PRINT"{1Ø SPACEs}ANOTHER R
    ACE?";              :REM*26
199Ø GOSUB216Ø          :REM*25
2ØØØ IFA$="Y"THEN212Ø   :REM*2Ø
2Ø1Ø X=1:PRINT"{SHFT CLR}{CRSR
    DN}{7 SPACEs}THE AFTERNOON
    S RESULTS:":PRINT   :REM*33
2Ø2Ø PRINTTAB(45) SE$(X);NA$(X)
    ;                   :REM*188
2Ø3Ø IFTA(X)>2ØØTHENPRINTTAB(2Ø
    )"WON{2 SPACEs}:";:GOTO2Ø5
    Ø                   :REM*129
2Ø4Ø PRINTTAB(2Ø)"LOST :";
                        :REM*177
2Ø5Ø PRINTTAB(3Ø);"$";ABS(TA(X)
    -2ØØ):X=X+1         :REM*153
2Ø6Ø IFEN(X)>ØTHEN2Ø8Ø  :REM*129
2Ø7Ø GOTO2Ø2Ø            :REM*64
2Ø8Ø PLAYC2$             :REM*96
2Ø9Ø FAST:GOSUB243Ø:GOSUB242Ø:P
    RINT"{2 CRSR DNs}{CTRL 2}{
    5 SPACEs}COME AGAIN":PRINT
    :SLOW               :REM*174
21ØØ PRINT"{5 SPACEs}BRING MONE
    Y{CTRL 1}":PLAYC3$  :REM*98
211Ø END                :REM*182
212Ø GOSUB232Ø:X=1:RN=RN+1
                        :REM*66
213Ø IFEN(X)>ØTHEN83Ø   :REM*86
214Ø GOSUB48Ø:GOTO213Ø  :REM*183
215Ø REM Y/N            :REM*1Ø3
216Ø PRINT"{2 SPACEs}Y/N": GOTO
    218Ø                :REM*165
217Ø PRINTTAB(12)"{CRSR DN}{CTR
    L 9}PRESS ANY KEY":REM*119
218Ø GETA$:IFA$<>""THEN218Ø
                        :REM*17
219Ø GETA$:IFA$=""THEN219Ø
                        :REM*11Ø
22ØØ RETURN             :REM*47
221Ø POKESS+24,15:SOUND1,3ØØØØ,
    2ØØ,Ø,4ØØØ,1ØØØ,1:SLEEP2:R
    ETURN               :REM*188
222Ø SPRSAVA$(3),7:GOSUB266Ø:RE
    TURN                :REM*253
223Ø REM TITLE          :REM*61
224Ø PRINT"{HOME}{CTRL 9}{2 CRS
    R DNs}{CTRL 4}{41 SPACEs}"
    ;                   :REM*1Ø
225Ø PRINT"{1Ø SPACEs}{17 COMD
    Is}{14 SPACEs}";    :REM*77
226Ø PRINT"{1Ø SPACEs}{CTRL Ø}{
    COMD F}{2 SPACEs}THOROUGHB
    IRD {COMD C}{CTRL 9}{1Ø SP
    ACEs}";             :REM*156
227Ø PRINT"{14 SPACEs}{CTRL Ø}{
    16 COMD Is}{CTRL 9}{COMD V
    }{1Ø SPACEs}";      :REM*17Ø
228Ø PRINTTAB(24Ø)TAB(21Ø)"{CTR
    L Ø}RACING{11 SPACEs}"
                        :REM*1Ø8
229Ø RETURN             :REM*137
23ØØ REM BOOKIE JOINT GRAPHIC
                        :REM*12
231Ø PRINT"{HOME}{CTRL 1}";:FOR
    I=1TO11:PRINT"{CTRL 9}";G$
    ;:NEXT:PRINT"{HOME}{CTRL 2
    }";:RETURN          :REM*111
232Ø POKE53281,Ø:POKE5328Ø,Ø
                        :REM*114
233Ø PRINT"{SHFT CLR}";:FORI=1T
    O11:PRINT:NEXT:PRINT"{COMD
     1}";               :REM*176
234Ø FORI=1TO3:PRINTG$;:NEXT
                        :REM*176
235Ø PRINTJ$;           :REM*184
236Ø PRINT"{CTRL 9}{12 SPACEs}{
    CTRL Ø}{CTRL 8} {SHFT B} {
    SHFT B} {SHFT B} {SHFT B}
    {COMD 1}{CTRL 9}{2 SPACEs}
    WEATHER {CTRL Ø}{CTRL 8}CL
    EAR{COMD 1}{CTRL 9}{4 SPAC
    Es}{CTRL Ø}";:PRINTJ$;
                        :REM*57
237Ø PRINT"{CTRL 9}{12 SPACEs}{
    CTRL Ø}{CTRL 8} {SHFT B} {
    SHFT B} {SHFT B} {SHFT B}
    {COMD 1}{CTRL 9}{2 SPACEs}
    TRACK{3 SPACEs}{CTRL Ø}{CT
    RL 8}FAST {COMD 1}{CTRL 9}
    {4 SPACEs}{CTRL Ø}";:PRINT
    J$;;J$;J$;          :REM*29
238Ø FORI=1TO3:PRINTG$;:NEXT
                        :REM*152
239Ø PRINT"{CTRL 9}{CTRL 6}{2 S
    PACEs}{SHFT B}{4 SPACEs}{S
    HFT B}{4 SPACEs}{SHFT B}{4
     SPACEs}{SHFT B}{4 SPACEs}
    {SHFT B}{4 SPACEs}{SHFT B}
    {4 SPACEs}{SHFT B}{4 SPACE
    s}{SHFT B} {HOME}{CTRL 2}"
    :POKE2Ø23,16Ø:POKE56295,5
                        :REM*34
24ØØ RETURN             :REM*231
241Ø SLEEP1:WINDOWØ,Ø,39,1Ø,1:R
    ETURN               :REM*225
242Ø PRINT"{HOME}{2 CRSR DNs}"T
    AB(2Ø6)"{CTRL 9}{CTRL 4}{C
    OMD M}{CTRL 4}{CTRL Ø}{COM
    D *}{CTRL 9}{2 SPACEs}{CTR
    L Ø}{CRSR DN}{3 CRSR LFs}{
    CTRL Ø}{CTRL 3}{SHFT X}{CT
    RL 9}{CTRL 4}{2 SPACEs}{CR
    SR DN}{3 CRSR LFs}{CTRL 4}
    {COMD *}{CTRL 9}{2 SPACEs}
    {CTRL Ø}":RETURN    :REM*176
243Ø POKE53281,Ø:POKE5328Ø,Ø:PR
    INT"{SHFT CLR}{CTRL 4}";:G
    OTO245Ø             :REM*21Ø
244Ø POKE53281,1:POKE5328Ø,Ø:PR
    INT"{SHFT CLR}{CTRL 4}";
                        :REM*95
245Ø G$="{CTRL 9}{4Ø SPACEs}{CT
    RL Ø}"              :REM*19Ø
246Ø J$="{CTRL 9}{12 SPACEs}{CT
    RL Ø}{CTRL 8} {SHFT B} {SH
    FT B} {SHFT B} {SHFT B} {C
    OMD 1}{CTRL 9}{19 SPACEs}{
    CTRL Ø}"            :REM*56
247Ø I$="{CTRL 9}{CTRL 4}{6 SPA
    CEs}{COMD M}{22 SPACEs}{CO
    MD 4} {COMD C}{2 SPACEs}{C
    TRL 4}{7 SPACEs}{CTRL Ø}"
                        :REM*243
248Ø HH$="{CTRL 9}{2Ø SPACEs}{1
    1 CRSR RTs}{CTRL Ø}{SHFT -
    }{3 CRSR RTs}{CTRL 9}{5 SP
    ACEs}"              :REM*75
249Ø FORX=1TO3:PRINTG$;:NEXT
                        :REM*99
25ØØ PRINT"{CTRL 9}{9 SPACEs}{C
    OMD @}{COMD P}{COMD O}{COM
    D I}{CTRL Ø}{COMD U}{COMD
    Y}{COMD T}{2 SPACEs}{COMD
    T}{COMD Y}{COMD U}{CTRL 9}
    {COMD I}{COMD O}{COMD P}{1
    6 SPACEs}{CTRL Ø}";:REM*27
251Ø PRINT"{CTRL 9}{7 SPACEs}{C
    OMD T}{COMD Y}{CTRL Ø}{COM
    D I}{COMD P}{COMD @}{4 SPA
    CEs}{COMD @}{COMD P}{COMD
    O}{COMD I}{CTRL 9}{COMD U}
    {COMD Y}{COMD T}{17 SPACEs
    }{CTRL Ø}";         :REM*153
252Ø PRINT"{CTRL 9}{13 SPACEs}{
    COMD T}{COMD Y}{COMD T}{24
     SPACEs}{CTRL Ø}";:REM*23Ø
253Ø PRINTG$;           :REM*1Ø9
254Ø PRINT"{CTRL 9}{CTRL 4}{6 S
    PACEs}{COMD M}{CTRL Ø}{CTR
    L 3} {SHFT Q} {CTRL 9}{CTR
    L 4}{17 SPACEs}{CTRL 1}{8
    SPACEs}{CTRL 4}{5 SPACEs}"
    ;                   :REM*193
255Ø PRINT"{CTRL 9}{CTRL 4}{6 S
    PACEs}{COMD M}{CTRL Ø}{CTR
    L 3}{SHFT Q}{SHFT +}{SHFT
    Q}{CTRL 9}{CTRL 4}{18 SPAC
    Es}{SHFT B}{4 SPACEs}{SHFT
     B} {COMD @}{COMD P}{COMD
    O}{COMD I}{CTRL Ø}{COMD U}
    ";                  :REM*161
256Ø PRINT"{CTRL 9}{CTRL 4}{6 S
    PACEs}{COMD M}{CTRL Ø}{CTR
    L 3} {SHFT Q} {CTRL 9}{CTR
    L 4}{17 SPACEs}{COMD 4}{8
    SPACEs}{CTRL 4}{COMD T}{CO
    MD Y}{COMD U}{CTRL Ø}{COMD
     I}{COMD @}";       :REM*112
257Ø FORX=1TO2:PRINTI$;:NEXT
                        :REM*143
258Ø PRINT"{CTRL 9}{CTRL 6}{6 S
    PACEs}{COMD M}{22 SPACEs}{
    COMD 4} {COMD C}{2 SPACEs}
    {CTRL 6}{7 SPACEs}{CTRL Ø}
    ";                  :REM*22Ø
259Ø PRINT"{CTRL 9}{CTRL 6}{COM
    D Y}{SHFT P}{4 COMD Ys}{SH
    FT P}{4 COMD Ys}{SHFT P}{4
     COMD Ys}{SHFT P}{4 COMD Y
    s}{SHFT P}{4 COMD Ys}{SHFT
     P}{2 COMD Ys}{COMD 4}{4 S
    PACEs}{CTRL 6}{3 COMD Ys}{
    SHFT O}{3 COMD Ys}{CTRL Ø}
    ";                  :REM*63
26ØØ FORX=1TO1Ø:PRINTTAB(31)"{C ►
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```
     TRL 6}{SHFT -}{2 SPACEs}";
                          :REM*170
261Ø IFINT((12-X)/2)=(12-X)/2TH
     ENPRINTINT(ABS((12-X)/2));
                          :REM*63
262Ø PRINT:{2 SPACEs}NEXT
                          :REM*195
263Ø PRINT"{CTRL 9}{2 SHFT Cs}{
     COMD R}{4 SHFT Cs}{COMD R}
     {4 SHFT Cs}{COMD R}{4 SHFT
      Cs}{COMD R}{4 SHFT Cs}{CO
     MD R}{4 SHFT Cs}{COMD R}{4
      SHFT Cs}{COMD R}{4 SHFT C
     s}{COMD R}{SHFT C}{HOME}":
     POKE2Ø23,192:POKE56295,5
                          :REM*171
264Ø RETURN               :REM*212
265Ø DATA" MIDNIGHT{5 SPACEs}",
     " RED WIDOW{4 SPACEs}"," P
     URPLE LADY{2 SPACEs}"," BL
     UE SMOKE{3 SPACEs}"," YELL
     OW BIRD{2 SPACEs}":REM*213
266Ø POKESS+24,15:SOUND3,44ØØØ,
     3Ø,Ø,41ØØØ,8Ø,2,23ØØ:FORT=
     1TO525:NEXT:SOUND3,4ØØØØ,2
     5,1,1ØØØØ,4ØØ,2,3ØØØ:RETUR
     N                    :REM*151
267Ø POKESS+24,15:SOUND1,39ØØØ,
     36,Ø,36ØØØ,5ØØ,2:RETURN
                          :REM*135
```

Listing 2. Spritemaker program.

```
1 REM SPRITEMAKER 128 BY HUGH M
  CMENAMIN                :REM*54
2 SA=3584                 :REM*121
3 READA$:IFA$="-1"THEN21
                          :REM*199
4 IFLEN(A$)<62THEN12      :REM*147
5 B$=MID$(A$,1,2Ø)+MID$(A$,22,2
  Ø)+MID$(A$,43,2Ø)       :REM*133
6 FORI=1TO3Ø              :REM*16Ø
7 C$=MID$(B$,(I*2)-1,2):H$=LEFT
  $(C$,1):L$=RIGHT$(C$,1)
                          :REM*2ØØ
8 H=VAL(H$):IFH$>"9"THENH=ASC(H
  $)-55                   :REM*112
9 L=VAL(L$):IFL$>"9"THENL=ASC(L
  $)-55                   :REM*151
1Ø BY=H*16+L:POKESA,BY:SA=SA+1
                          :REM*2ØØ
11 PRINT".";:NEXT:GOTO3:REM*186
12 IFLEN(A$)<21THENB$=A$:GOTO15
                          :REM*112
13 IFLEN(A$)<42THENB$=LEFT$(A$,
   2Ø)+RIGHT$(A$,(LEN(A$)-21)):
   GOTO15                 :REM*1Ø1
14 B$=LEFT$(A$,2Ø)+MID$(A$,22,2
   Ø)+RIGHT$(A$,LEN(A$)-42)
                          :REM*243
15 FORI=1TOLEN(B$)/2      :REM*148
16 C$=MID$(B$,(I*2)-1,2):H$=LEF
   T$(C$,1):L$=RIGHT$(C$,1)
                          :REM*195
17 H=VAL(H$):IFH$>"9"THENH=ASC(
   H$)-55                 :REM*1Ø3
18 L=VAL(L$):IFL$>"9"THENL=ASC(
   L$)-55                 :REM*158
19 BY=H*16+L:POKESA,BY:SA=SA+1
                          :REM*193
2Ø NEXT:GOTO3             :REM*114
21 BSAVE"SPRITES",BØ,P3584TOP4Ø
   96                     :REM*248
22 END                    :REM*15Ø
1ØØ DATA ØØ7EØØØ3FFCØØFFFFØ1F F
   FFØ1FFFF81FFFF8DC7C 7BFEFEF
   F7FFFFE7FFFFE          :REM*151
11Ø DATA FFFFFFDFFFFB1FC3F81F F
   FF8ØFFFFØØ3FFCØØØFF ØØØØ7EØ
   ØØØ7EØØØØ7EØØ         :REM*237
12Ø DATA ØØ7EØØØØØØ7EØØØ3FFCØ Ø
   FFFFØ1FFFFØ1FFFF81F FFF8DC7
   C7BFDFDFF7FFF          :REM*92
13Ø DATA FE7FFFFEFFFFFFDEFF7B 1
   F3CF81FC3F8ØFFFFØØ3 FFCØØØF
   FØØØØ7EØØØØ7E         :REM*179
14Ø DATA ØØØØ7EØØØØ7EØØØØØØ7E Ø
   ØØ3FFCØØFFFFØ1FFFFØ 1FFFF81
   FFFF8DFFC7BDD          :REM*82
15Ø DATA DEFF7E3FFE7FFFFEFFFF F
   FDFFF7B1FFCF8ØF83F8 ØFFFFØØ
   3FFCØØØFFØØØØ         :REM*15Ø
16Ø DATA 7EØØØØ7EØØØØ7EØØØØ7E Ø
   ØD5ØØ7EØØØ3FFCØØFFF FØ1FFFF
   Ø1FFFF81C3C38          :REM*251
17Ø DATA DFDBFBFE7E7F7FFFFE7F F
   FFEFFFFFDF81FB1E7E 781FFFF
   8ØFFFFØØ3FFCØ          :REM*16
18Ø DATA ØØFFØØØØ7EØØØØ7EØØØØ 7
   EØØØØ7EØØD5ØØØØØØØ ØØØØØØ5
   5ØØØØ55ØØØØ55         :REM*255
19Ø DATA ØØØØØØØØØØØØØØØØØØØØ Ø
   Ø14ØØØB55EØ2D6978B9 556EED5
   57BBB55EE2E55          :REM*25
2ØØ DATA B8ØB96EØØED7BØØB96EØ Ø
   ED5B83BØØEEECØØBB2A ØØØØØØØ
   ØØØØØØØ55ØØØØ         :REM*128
21Ø DATA 55ØØØØ55ØØØØØØØØØØØ Ø
   ØØØØØØØØØ14ØØ3B55EC 2D69783
   9556C2D55783B          :REM*251
22Ø DATA 55EC2E55B83B96ECØED7 B
   ØØB96EØØED7BØØB82EØ ØEØØBØ2
   AØØØØØ6ØØØ47          :REM*72
23Ø DATA ØØØØF4ØØØØE6ØØØ182ØØ Ø
   341ØØ1EA16Ø7FE2FBFF FEØFFFF
   EØ7FFFCØ3FFF8          :REM*9
24Ø DATA Ø1FFFØØØØ5EØØØØAØØØØ 1
   CØØØØØAØØØØ11ØØØØ2Ø 8ØØØ4Ø4
   ØØØ4Ø3ØØØØØØØ         :REM*148
25Ø DATA Ø6ØØØ1Ø7ØØØ3C4ØØØ382 Ø
   ØØ7Ø2ØØØDC2ØØ3BØ2ØØ FFC467F
   FFCFFFFFC8FFF          :REM*11
26Ø DATA F8Ø7FFFØØ3FFEØØØ3D8Ø Ø
   7E1ØØØ4Ø2ØØØ8Ø7FE1Ø ØØØ12ØØ
   ØØØCØØØØØØØØ          :REM*34
27Ø DATA ØØØØ,-1          :REM*251
```


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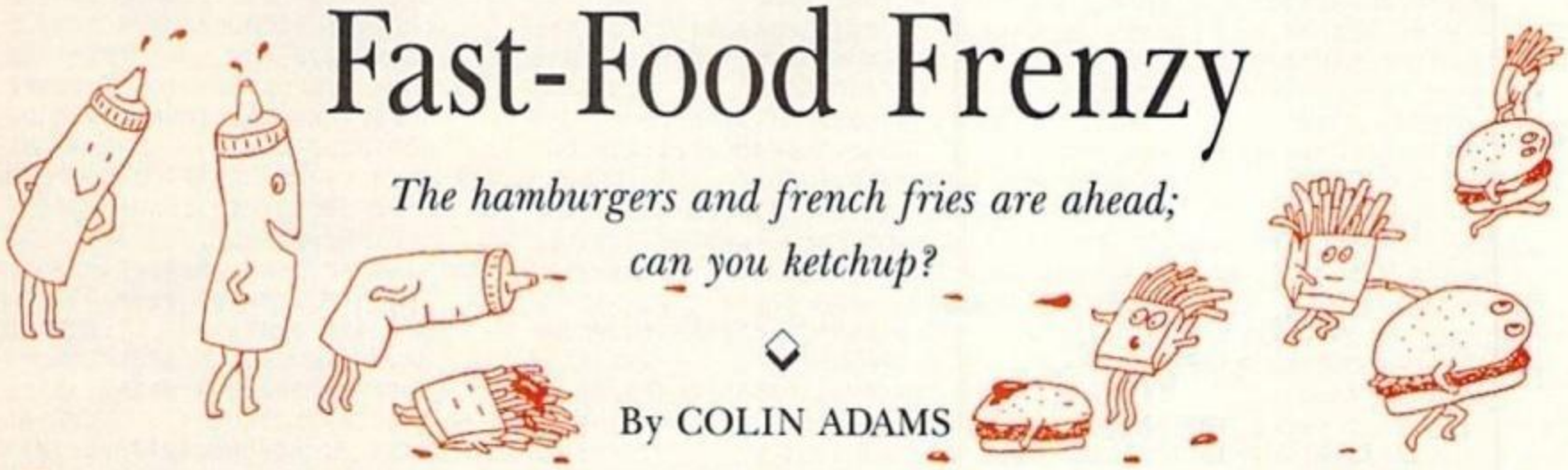

The hamburgers and french fries are ahead; can you ketchup?

By COLIN ADAMS

In Ketchup Attack, a shoot-'em-up game that you'll play with relish, a barrage of hamburgers and french fries descends toward the squeezable ketchup bottle poised at the bottom of the screen.

To dispatch the incoming edibles, move the bottle left and right with a joystick in port 2 and squirt ketchup at them by pressing the firebutton. Hitting a bag of fries raises your score by 20 points, a burger by 30.

Of course, while you're squirting the fast foods, you must avoid colliding with them; each collision costs a "life." You start play with four lives, lose one to each collision, but then gain one for every level completed. To complete a level, you must splat a number of burgers equal to your level number multiplied by ten. In other words, at level two you must splat 20 burgers.

The game is written entirely in machine language, encoded into Basic Data statements. Type in Listing 1, using *RUN*'s Checksum program to detect typing errors, and save a copy to disk before you run it.

After you have run Listing 1, which creates the actual machine language program called Ketchup Attack, type in and save the following small boot program on the same disk.

```
10 IF A=0 THEN A=1:LOAD"KETCHUP
   ATTACK",8,1                  :REM*228
20 SYS 49152                    :REM*186
```

To play the game, just load and run the boot program. R

An 11th grade student in Canada, Colin Adams is a self-taught programmer.

Running Instructions: **Type in, save and run Listing 1 and then the boot program in the text. To play, load and run the boot program.**

Listing 1. Machine language creator program. (Available on ReRUN disk. See page 37.)

```
Ø REM LISTING 1 CREATES (AND SH
  OULD NOT BE CALLED) KETCHUP A
  TTACK                     :REM*124
5 OPEN 8,8,8,"KETCHUP ATTACK,P,
  W"                        :REM*254
6 CT=Ø:PRINT"{SHFT CLR}":REM*56
1Ø READ A$:IF A$="-1" THEN CLOS
  E8:PRINT:PRINT"ALL DONE":END
                            :REM*23
12 PRINT"{HOME}READING LINE "+S
  TR$(CT):CT=CT+1           :REM*141
15 IF LEN(A$)<62 THEN 55
                            :REM*254
2Ø B$=MID$(A$,1,2Ø)+MID$(A$,22,
  2Ø)+MID$(A$,43,2Ø)        :REM*242
25 FOR I=1 TO 3Ø            :REM*181
3Ø C$=MID$(B$,(I*2)-1,2):H$=LEF
  T$(C$,1):L$=RIGHT$(C$,1)
                            :REM*2Ø9
35 H=VAL(H$):IF H$>"9" THEN H=A
  SC(H$)-55                 :REM*85
4Ø L=VAL(L$):IF L$>"9" THEN L=A
  SC(L$)-55                 :REM*136
45 BY=H*16+L:PRINT#8,CHR$(BY);
                            :REM*67
5Ø NEXT:GOTO 1Ø             :REM*115
55 IF LEN(A$)<21 THEN B$=A$:GOT
  O 7Ø                      :REM*184
6Ø IF LEN(A$)<42 THEN B$=LEFT$(
  A$,2Ø)+RIGHT$(A$,(LEN(A$)-21
  )):GOTO 7Ø                :REM*176
65 B$=LEFT$(A$,2Ø)+MID$(A$,22,2
  Ø)+RIGHT$(A$,LEN(A$)-42)
                            :REM*14Ø
7Ø FOR I=1 TO LEN(B$)/2:REM*221
75 C$=MID$(B$,(I*2)-1,2):H$=LEF
  T$(C$,1):L$=RIGHT$(C$,1)
                            :REM*14Ø
8Ø H=VAL(H$):IF H$>"9" THEN H=A
  SC(H$)-55                 :REM*56
85 L=VAL(L$):IF L$>"9" THEN L=A
  SC(L$)-55                 :REM*84
9Ø BY=H*16+L:PRINT#8,CHR$(BY);
                            :REM*148
95 NEXT:GOTO 1Ø             :REM*16Ø
1ØØ REM KETCHUP ATTACK      :REM*43
1Ø1 DATA ØØCØ2Ø46CØ2Ø5DC22Ø9Ø*C
    22ØFAC12ØC6CØ2ØBØC2*2ØABCØ2
    ØD8C52Ø9DC32Ø           :REM*62
1Ø2 DATA DFC42Ø75C52Ø36C12Ø8F*C
    12ØØ7C32Ø57C32ØC6C3*2ØØCC4C
    EEDC8ADEDC8DØ           :REM*78
1Ø3 DATA E6A9ØØ8DØ4DØ8DØ5DØ4C*2
    1CØAØØØB952C699ØØ3Ø*C8DØF7A
    ØØØB952C799ØØ          :REM*235
1Ø4 DATA 31C8CØ419ØF5A9CØ8DF8*Ø
    7A9C18DF9Ø7A9C28DFA*Ø7A9C38
    DFBØ78DFCØ78D           :REM*214
1Ø5 DATA FDØ7A9C48DFEØ78DFFØ7*A
    9FB8D1CDØA9Ø28D25DØ*A9Ø58D2
    6DØA9Ø7AØØØ99           :REM*233
1Ø6 DATA 27DØC8CØØ8DØF8A9Ø18D*2
    9DØA9Ø48D1DDØA9FF8D*17DØ6ØA
    9FD8D15DØA9DØ           :REM*17
1Ø7 DATA 8DØ1DØA97D8DØØDØA9ØØ*A
    899Ø4DØC8CØØCDØF86Ø*A9ØØ8D2
    ØDØ8D21DØ8D1E           :REM*27
1Ø8 DATA DØA9932ØD2FFA2FF8EDD*C
    8A9Ø48DDEC82ØF7CØA9*ØØ8DDFC
    82Ø11C1CEDEC8           :REM*149
1Ø9 DATA ADDEC8DØED2ØF7CØ6ØEE*D
    DC8AEDDC8AØ1D2Ø58C2*AØØØB99
    2C7FØØ7C82ØD2           :REM*3
11Ø DATA FF4CØ4C16ØEEDDC8AEDD*C
    8AØ1D2Ø58C2AØØØB99F*C7FØØ7C
    82ØD2FF4C1EC1           :REM*15
111 DATA EEDFC8ADDFC8C9Ø5DØDD*6
    Ø6ØCEDCC8ADDCC8DØ3A*AEE4C88
    EDCC8A9ØØ8DD9           :REM*123
112 DATA C8AØØ1ADØØDCC97BDØØ3*4
    C79C1C977DØØ34C84C1*C96FDØØ
    48CD9C86ØC96B           :REM*59
113 DATA DØØ68CD9C84C79C1C967*D
    ØØ68CD9C84C84C16ØAD*ØØDØC91
    99ØF8CEØØDØ6Ø           :REM*166
114 DATA ADØØDØC9EBBØEDEEØØDØ*6
    ØAD1EDØ48A9ØØ8D1EDØ*68C9Ø9F
    Ø11C911FØØDC9           :REM*174
115 DATA 21FØØ9C941FØØ5C981FØ*Ø
    16ØAD15DØ29FE8D15DØ*2Ø33C6A
    9ØØ8D1EDØAEØØ           :REM*53
116 DATA DØACØ1DØ8EØ4DØ8CØ5DØ*6
    8682ØØEC6CEDAC82ØE9*C12ØDFC ►
```

RUN it right: **C-64; joystick**

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```
    42ØEAC12ØEAC1        :REM*227
117 DATA ADDAC8DØØ34CØ2C24CØC*C
    Ø6ØEE2ØDØA9ØØ8DØØDC*ADØØDCC
    96FDØF16ØADØØ        :REM*13Ø
118 DATA DCC96FDØF96ØA9ØØ8D15*D
    Ø8DEFC88DFØC88DEØC8*2ØØEC6A
    9Ø48DDAC8A9Ø1         :REM*64
119 DATA 8DF1C8A91E8DE5C88DEB*C
    8A9198DE6C8A9ØA8DF3*C88DF5C
    8A9148DE9C8A2         :REM*154
12Ø DATA ØBAØØA2Ø58C2AØØØB9A8*C
    8FØØ7C82ØD2FF4C4ØC2*2ØEAC12
    ØEAC12ØEAC14C         :REM*65
121 DATA ØØCØ182ØFØFF6ØA9ØØ8D*2
    1DØA9Ø68D2ØDØA9932Ø*D2FFAØØ
    ØB9AEC7FØØ7C8         :REM*1Ø
122 DATA 2ØD2FF4C6EC2A2Ø4AØØ4*2
    Ø58C2AØØØB9FBC7FØØ7*C82ØD2F
    F4C83C26ØA9C8         :REM*2Ø9
123 DATA 8DØØDØ8DØ6DØ8DØCDØA9*4
    B8DØ1DØA9848DØ7DØA9*B48DØDD
    ØA9498D15DØ6Ø         :REM*234
124 DATA A2Ø2AØ1F2Ø58C2A98A85*5
    7A9C885582Ø F9C2A2Ø8*AØ1F2Ø5
    8C2A9938557A9         :REM*148
125 DATA C885582ØF9C2A2ØEAØ1F*2
    Ø58C2A99A8557A9C885*582ØF9C
    2A214AØ1F2Ø58         :REM*21Ø
126 DATA C2A9A18557A9C885582Ø*F
    9C26ØAØØØB157FØØ7C8*2ØD2FF4
    CFBC26ØADEØC8         :REM*249
127 DATA FØØ34C32C3ADD9C8DØØ1*6
    ØA9Ø18DEØC82Ø14C6AD*15DØØ9Ø
    28D15DØAEØØDØ         :REM*83
128 DATA AC Ø1DØ8EØ2DØ8CØ3DØ6Ø*C
    EE1C8ADE1C8FØØ16ØAD*EEC88DE
    1C8CEØ3DØADØ3         :REM*67
129 DATA DØDØØDA9ØØ8DEØC8AD15*D
    Ø29FD8D15DØ6ØCEE2C8*ADE2C8F
    ØØ16ØADE5C88D         :REM*47
13Ø DATA E2C8ADØ7DØFØ14ADØ9DØ*F
    Ø19ADØBDØFØ1EEEØ7DØ*EEØ9DØE
    EØBDØ6Ø2ØBAC3         :REM*198
131 DATA 8DØ6DØ2ØA8C36Ø2ØBAC3*8
    DØ8DØ2ØB1C36Ø2ØBAC3*8DØADØE
    EØBDØ6ØA9FF8D         :REM*184
132 DATA ØFD4A98Ø8D12D46ØAØØA*E
    EØ7DØ88DØFA6ØAØØ5EE*Ø9DØ88D
    ØFA6ØAD1BD4C9         :REM*118
133 DATA 199ØF9C9EBBØF56ØCEE3*C
    8ADE3C8FØØ16ØADE6C8*8DE3C8A
    DØDDØFØØCADØF         :REM*45
134 DATA DØFØ11EEØDDØEEØFDØ6Ø*2
    ØBAC38DØCDØ2ØFAC36Ø*2ØBAC38
    DØEDØ2Ø03C46Ø         :REM*132
135 DATA AØØ7EEØDDØ88DØFA6ØAØ*Ø
    3EEØFDØ88DØFA6ØAD1E*DØ48A9Ø
    Ø8D1EDØAØØØ68         :REM*248
136 DATA C9ØAFØ11C912FØ1CC922*F
    Ø27C942FØ32C982FØ3D*6ØADØ6D
    ØAEØ7DØ2Ø78C4         :REM*184
137 DATA 8CØ7DØ4C7FC4ADØ8DØAE*Ø
    9DØ2Ø78C48CØ9DØ4C7F*C4ADØAD
    ØAEØBDØ2Ø78C4         :REM*176
138 DATA 8CØBDØ4C7FC4ADØCDØAE*Ø
    DDØ2Ø78C48CØDDØ4C91*C4ADØED
    ØAEØFDØ2Ø78C4         :REM*183
139 DATA 8CØFDØ4C91C48DØ4DØ8E*Ø
    5DØ6ØADE9C88DE7C8AD*EAC88DE
    8C82ØCBC44CA3         :REM*238
14Ø DATA C4ADEBC88DE7C8ADECC8*8
    DE8C82ØCBC4CEF3C8AD*15DØ29F
    D8D15DØA9ØØ8D         :REM*244
141 DATA EØC88DEDC82ØFFC4ADF3*C
    8DØØ34C2ØC5C9Ø9DØØ8*A92Ø8D9
    ØØ72ØFFC46Ø18         :REM*48
142 DATA ADE7C86DEFC88DEFC8AD*E
    8C86DFØC88DFØC86ØA2*ØAAØ1F2
    Ø58C2AEF1C8AD         :REM*95
143 DATA F2C82ØCDBDA21ØAØ1F2Ø*5
    8C2AEDAC8ADDBC82ØCD*BDA2Ø4A
    Ø1F2Ø58C2AEEF         :REM*3Ø
144 DATA C8ADFØC82ØCDBDA216AØ*1
    F2Ø58C2AEF3C8ADF4C8*2ØCDBD6
    Ø68682ØØEC62Ø         :REM*11Ø
145 DATA 33C6A9ØØ8D15DØEEF1C8*C
    EE5C8CEE5C8CEE5C8CE*E6C8CEE
    6C8CEE6C8EEDA         :REM*142
146 DATA C818ADF5C869ØA8DF5C8*8
    DF3C8A2ØBAØØ72Ø58C2*AØØØB9B
    5C8FØØ72ØD2FF         :REM*213
147 DATA C84C5AC52ØDFC42ØEAC1*2
    ØEAC12ØEAC14CØCCØA2*Ø1AØØ78
```


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```
    EDDC82Ø58C2AØ          :REM*187
148 DATA ØØB9C7C8FØØ7C82ØD2FF*4
    C81C518A9Ø66DDDC88D*DDC8ADD
    DC8C917BØØ9AA          :REM*66
149 DATA AØØ72Ø58C24C7FC5A2Ø4*A
    ØØ48EDDC82Ø58C2AØØØ*B9C7C8F
    ØØ7C82ØD2FF4C          :REM*2Ø9
15Ø DATA B2C518A9Ø66DDDC88DDD*C
    8ADDDC8C917BØØ9AAAØ*Ø42Ø58C
    24CBØC56ØA9ØØ          :REM*77
151 DATA AØ1899ØØD488DØFAA9ØF*8
    DØ5D4A9FF8DØ6D4A981*8DØ4D4A
    9Ø48DØ1D4A93E          :REM*173
152 DATA 8DØØD4A9498D15D4A9Ø1*8
    D16D48D17D4A99F8D18*D46ØA98
    Ø8DØ4D46ØA98Ø          :REM*182
153 DATA 8DØBD4A9Ø98DØ8D4A94Ø*8
    DØ7D4A98Ø8DØCD4A9ØØ*8DØDD4A
    9818DØBD46ØA9          :REM*134
154 DATA 8Ø8DØBD4A9Ø38DØ8D4A9*A
    Ø8DØ7D4A91A8DØCD4A9*ØØ8DØDD
    4A9818DØBD46Ø          :REM*11Ø
155 DATA ØØØØØØØ14ØØØØ14ØØØØ*1
    4ØØØØ14ØØØØ14ØØØØ55*ØØØØ55Ø
    ØØ1554ØØ1554Ø          :REM*126
156 DATA Ø2558ØØ2AA8ØØ2998ØØ2*9
    68ØØ2998ØØ1AA4ØØ155*4ØØ2558
    ØØ2AA8ØØØAAØØ          :REM*149
157 DATA ØØ28ØØØØØØØØØØØ14ØØ*Ø
    Ø45ØØØØ51ØØØØ15ØØØØ*Ø4ØØØØ1
    ØØØØØØ4ØØØØØ          :REM*56
158 DATA ØØØØ1ØØØØØØØØØØØ4ØØ*Ø
    ØØØØØØØØØØØØØØØØØØ*ØØØØØØØ
    ØØØØØØØØØØØØ          :REM*196
159 DATA ØØØØØØØØØØØØØØØØØØØ*Ø
    ØØØØØØØØØØØØØØØØØØ*4C84EAA
    A8A4A8A8A4A8A          :REM*36
16Ø DATA 8A4A8A8A4A4C8E4A288A*4
    A288A4A288A4AA88A4Ø*48EA4AØ
    ØØØØØØØØØØØØ          :REM*143
161 DATA ØØØØØØØØØØØØØØØØØØØ*Ø
    ØØØØØØØØØØØØØØ2Ø82*ØØØ888Ø
    Ø088A2Ø8AA88Ø          :REM*66
162 DATA 2A2A8Ø18A29Ø16AA5Ø15*5
    55Ø169A5Ø15555Ø1565*5Ø15655
    Ø19559Ø16AA5Ø          :REM*47
163 DATA Ø5554ØØ155ØØØØØØØØØ*Ø
    ØØØØØØØØØØØØØØØØØØ*ØØØØØØØ
    ØØØØØØØØØØØØ          :REM*76
164 DATA ØØØAAAAØ2AAAA82AAAA8*F
    FFFFF777F5D2AAEAC2A*AAA8ØAA
    AAØØØØØØØØØØ          :REM*23Ø
165 DATA ØØØØØØØØØØØØØØØØØØØ*Ø
    ØØØØØØØØØØØØØØØØØØ*121F2Ø2
    Ø2Ø2Ø2Ø2Ø2Ø2Ø          :REM*33
166 DATA 2Ø2ØØØ121F2Ø922Ø2Ø2Ø*2
    Ø2Ø2Ø2Ø2Ø122ØØØ92Ø5*2Ø2Ø494
    E5445522D5354          :REM*19
167 DATA 454C4C4152Ø4B455443*4
    8555Ø2Ø434F4E46524F*4E54415
    4494F4EØD9E2Ø          :REM*236
168 DATA 2Ø2Ø2Ø2Ø42592Ø434F4C*4
    94E2Ø4144414D532Ø26*2Ø42524
    55454Ø2Ø4B415Ø         :REM*2Ø6
169 DATA 494C494BØØ1E5448452Ø*4
    74F4F442Ø4755590D2Ø*ØD1F2Ø2
    Ø2Ø2Ø2Ø2Ø2Ø4F          :REM*254
17Ø DATA 5552Ø4845524F2Ø2D2D*3
    EØDØDØDØDØD1E2Ø2Ø2Ø*2Ø54484
    52Ø4241442Ø47          :REM*55
171 DATA 555953ØD2ØØD1F2Ø2Ø2Ø*2
    Ø2Ø4B494C4C45522Ø46*5259Ø2
    D2D3EØD2ØØD1C          :REM*19
172 DATA 2Ø2Ø2Ø2Ø2Ø323Ø2Ø5Ø4F*4
    94E5453ØD2ØØD2ØØD1F*2Ø2Ø5Ø5
    35943484F2Ø42          :REM*15Ø
173 DATA 555247455522Ø2D2D3EØD*2
    ØØD1C2Ø2Ø2Ø2Ø2Ø333Ø*2Ø5Ø4F4
    94E5453ØØ1E92          :REM*2ØØ
174 DATA 53434F52453AØØ4C4556*4
    54C3AØØ4C495645533A*ØØ544F2
    Ø474F3AØØ921C          :REM*173
175 DATA 47414D452Ø4F56455221*Ø
    Ø921C4C4556454C2Ø43*4F4D5Ø4
    C4554544ØØ2E          :REM*158
176 DATA 2Ø2Ø2Ø2Ø2Ø2Ø2Ø2E2Ø2Ø*2
    Ø2Ø2Ø2Ø2E2ØØØØ4ØØ*14ØØØØØ
    ØØØØA1E19141E          :REM*88
177 DATA 19ØØØØ14ØØ1EØØFFØAØØ*Ø
    ØØ1ØØØAØØØAØØ          :REM*19Ø
178 DATA -1                :REM*32
```

■

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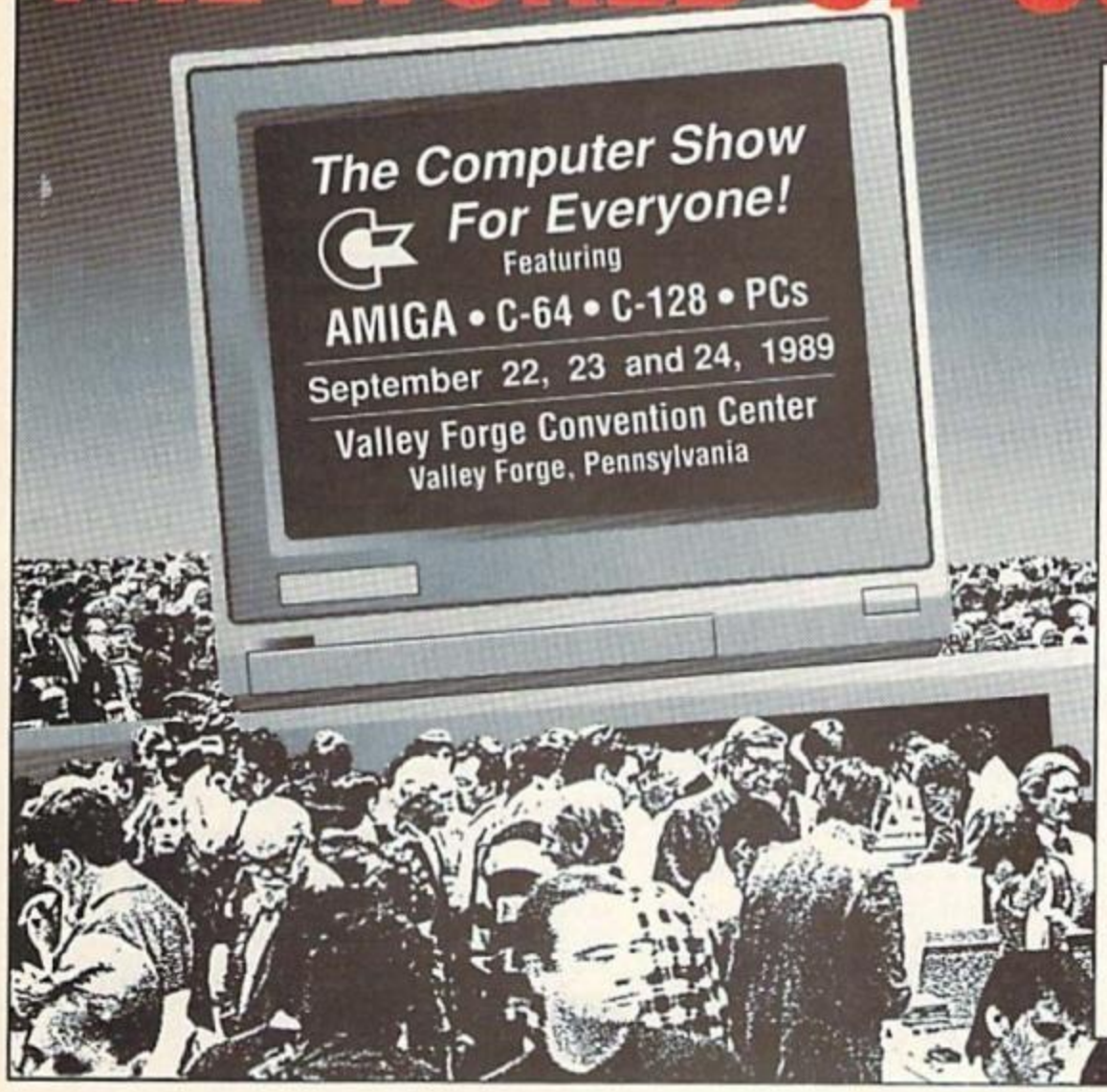

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TELECOMPUTING WORKSHOP

Loren's latest and greatest list of telecomputing tools of the trade.

By LOREN LOVHAUG

TELECOMMUNICATING CAN often add new meaning to the adage, "Nothing worth doing is easy." Fortunately, armed with a few choice tools and a little experience, some of the tedium can be rendered more palatable.

One of my goals for this column has been to help you acquire the tools and experience necessary to make your online sessions more enjoyable. Here's a look at what I call my "odds and ends" list. These utilities are sometimes difficult to classify, but are easy to justify.

OMEGA-Q

In my opinion, Omega-Q is the single greatest thing to happen to C-64/128 telecommunications since 1200-baud modems became affordable. This utility is likely to take the place of at least a dozen programs as your favorite utility disk.

Omega-Q combines the best features of a disk-file copier and sequential file reader/printer. It also has the ability to dissolve files that have been combined or compressed with any of the major C-64/128 file-transfer utilities, including those created with Arc, Lynx, Library and Arkive. (For a discussion of the aforementioned, see this column in the June 1989 issue of *RUN*.) In addition, Omega-Q can dissolve a disk full of self-dissolving Arc- or SIDplayer-type music files at one time!

The program is menu driven, well documented and so precisely implemented that it could serve as an example to Commodore programmers of how to create a straightforward, yet comprehensive, application.

Omega-Q supports both single and multiple drive configurations (including any combination of 1541, 1571 and 1581), and lets you perform a variety of disk housekeeping functions like file copying, batch scratching and disk formatting. Other useful disk functions—file locking and unlocking, file unscratching and file-type changing—are also supported. I salute Robert Stoerrle for creating what I consider to be the finest, all-inclusive telecommunications utility in the Commodore world.

Omega-Q has been licensed to Quantum Computer Services, so it can't be placed on any other commercial telecommunications system. However, user's groups and BBS SYSOPs can get permission from Q-Link to distribute and retransmit the program. I strongly recommend that anyone with access to Q-Link download this program.

VELVEETA 64 AND VELVEETA 128

Long-time Commodore programmer, Kevin Hisel, is responsible for some of the greatest 64/128 public domain utilities, including his famous Disk Doctor programs. One of his lesser-known triumphs is Velveeta, so named because it transforms and blends sequential text files into a generic format. For instance, Velveeta can be prompted to strip carriage returns that often terminate lines (especially in files buffered during online sessions), making text much easier to reformat with word processors.

In addition, Velveeta can be told to strip the non-alphanumeric formatting characters that some word processors add to text. You can also have the program remove leading and trailing spaces from justified text, as well as add two spaces after punctuation marks at the ends of sentences.

Even if you only capture an occasional text file or exchange word-processed text via modem, I strongly suggest you download Velveeta from Q-Link, GEnie or your local BBS.

EBBSTERM44/128

Ed Parry's EBBSTERM is a very simple, bare-bones C-128 terminal program that could easily go unnoticed in the sea of public domain programs. However, if you use GEnie or any other non-Commodore-exclusive telecommunications network or BBS, you might want to grab this little wonder. What makes EBBSTERM so special is that it supports some very fast and convenient file-transfer protocols not normally found in Commodore 8-bit terminal programs. Examples of these are the 1K Xmodem and Ymodem batch (multi-transfer) as well as the standard Xmodem and Punter.

On a system like GEnie that supports Ymodem batch transfers, you can use EBBSTERM to specify that multiple files automatically be transmitted and saved to your disk without user intervention. Simply, this means that you can tell the system you're downloading from to send the files you want, and Ymodem batch takes care of the details.

GEOS CONVERT (V2.1 OR LATER)

According to Berkeley Softworks, there are now 500,000 GEOS users worldwide. Many of these people are using GEOS to create beautiful artwork, sharp character fonts and even custom applications.

However, due to the data filetypes and extra information Berkeley encodes in GEOS directories, GEOS files can't be easily transferred by most conventional terminal packages. To solve this dilemma, Berkeley and some talented GEOS programmers have created file conversion utilities that transform GEOS files into specially encoded sequential or program files.

These utilities run under GEOS and utilize standard point-and-click-type file requestors and gadgets. Although there are a number of versions of this utility, I strongly recommend that you look for versions 2.1 or later, authored by renowned GEOS programmer Bill Coleman, as his are generally faster and more thorough. ■

Loren Lovhaug is a programmer and writer with lots of telecommunications experience. Along with being SYSOP of Q-Link's C-128 Special Interest Group, he publishes Twin Cities 128, *a newlsetter for C-128 users. You can write to him care of Telecomputing Workshop, RUN Magazine, 80 Elm St., Peterborough, NH 03458.*

You can also send him electronic mail on QuantumLink (LOVHAUG) or GEnie (Sparrow.J).

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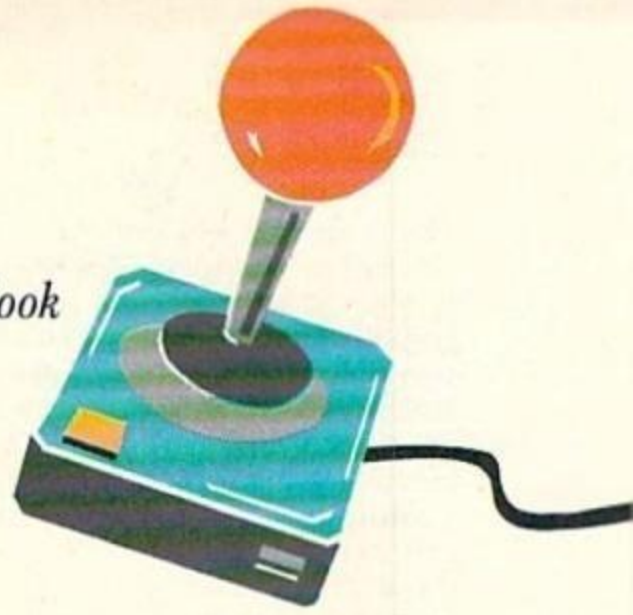

From board game to mainframe to personal computer, here's a look at the evolution of fantasy role-playing games.

By JOHN RYAN

ADVANCED DUNGEONS AND DRAGONS (AD&D), which appeared as a board game in the 1970s, caught on quickly, making the transition from cottage industry to world-wide success story. Aside from an active imagination, this early AD&D required little in the way of resources or equipment, other than a player's handbook and dice, and it was avidly played by hosts of college students, perhaps as an antidote to dull books.

In retrospect, it seems perfectly logical that AD&D's next metamorphosis should be to the computer. Actually, one of the most successful pre-1980s' computer games was written for a mainframe. Called Adventure, it had a cult-like following among college campus techies and business people whose companies boasted mainframe computers. Then, as the first personal computers began to make their way out of Silicon Valley, it didn't take long to see that AD&D and other games would lend themselves well to the PC medium.

PURE WIZARDRY

In 1981, when Wizardry: Proving Grounds of the Mad Overlord (see *RUN*'s Software Gallery for November 1988) was released for the Apple computer, the world was introduced to fantasy role-playing (FRP) on a personal level; its success was phenomenal.

The Wizardry series, now numbering five, proved that the essence of AD&D could be brought to life on PCs. The two Commodore versions basically present the same gaming style: You must gather together and equip a group of six adventurers, and then set off in search of exciting experiences in underground mazes.

In keeping with the AD&D configuration, Wizardry lets you create characters of different races—elves, dwarves and gnomes, among others. Each character can possess varying levels of strength, IQ, piety, vitality, agility and luck. (You'll notice that many authors go to great lengths to avoid the same characteristics listed in the original AD&D manuals: strength, intelligence, wisdom, dexterity, constitution and charisma.)

Wizardry I.

The day is hazy, yet there is a cooling breeze. The latest in a series of personal crises seems insurmountable. You are being pulled apart in all directions.0

Ultima IV.

The dungeons of Wizardry are really the heart of the program, for it is there where characters either die a quick death or slowly gain the resources to grow into superior fighters through experience and gold gained in battle. Dying in Wizardry is very easy to do, and since you need characters developed in Wizardry I to play the second scenario, losing a key player can be a traumatic experience. It's no wonder that Wizardry players tend to be fanatical about periodically backing up character disks or purchasing special editors that let them bring dead characters back to life.

THE BRITISH INVASION

The years from 1981 to 1983 were a confusing time, beset by a market frantic in its efforts to introduce new arcade games to satisfy the appetite of the software-hungry public. Richard Garriott—pegged early on in life with the nickname, Lord British—saw things differently, and was eager to produce a product that could bring the flavor of AD&D to the public, yet present it in a style consistent with his own personal philosophy. Late in 1980, Ultima I was born. The game's marginal success moved Garriott to create Ultima II, which laid the groundwork for a string of best-selling Ultima sequels.

The Ultima sagas evolved into a genre of their own. Gone were the simple, hack and slash, find-the-treasure adventures with stark 3-D corridors and parry-thrust-parry battles. Welcome to the realm of Britannia, a mythical land of chivalry and dragons, and the benevolent Lord British himself.

As the years passed, each new Ultima grew in sophistication, changing from good versus evil contests into more intricate adventures. In Ultima IV (Software Gallery, June 1986), we began to see honesty, humility and justice, which led many gamers to reverse their long-standing inclination to kill everything in sight!

In Ultima V (see Games Gallery in *RUN*'s February 1989 issue), Lord British has vanished, and you must face personal and moral dilemmas as you travel through Britannia in search of him. The game is four disks long, and the detail is astounding. Ultima has become the king of spot animation. You'll find waterfalls, clocks that tick, mirrors that reflect, and a working, traveling populace.

Veterans of previous Ultimas will be glad to know that they can use their old characters. If you go into Ultima V afresh, you spend more time—at least initially—trying to survive while recruiting other characters for your party.

Ultima VI, now under development, should be ready within two years.

THEY SAW FARTHER

The Bard's Tale series can trace its roots back to Wizardry. Many Bard's ►

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Tale command structures are virtually identical to Wizardry's. But where Wizardry was basic design, bare-bones graphics, with a rather shallow plot, Bard's Tale I (Software Gallery, July 1986) bolted from the gates with a clear-cut mission: Give the player a D&D environment, three-dimensional graphics, a town, dungeons to move around in and skull-knocking puzzles and plot twists. These qualities, incorporated by programmers Brian Fargo and Michael Cranford, proved successful. Bard's Tale quickly moved to the top of the software charts soon after its release in 1985.

Bard's Tale I, staged in the mythical town of Skara Brae, sets you and five other comrades in search of the evil wizard, Mangar. Like Wizardry, there are a host of character classes, races and professions to choose from. Perhaps the most ambitious addition to this type of game, however, is the inclusion of four separate spellcaster classes and over 80 different spells!

By the time Bard's Tale II: Destiny Knight (Software Gallery, April 1987) appeared in 1986, it found an active gaming public with a voracious appetite for more of the saga. While it is clearly a more ambitious program than its predecessor, Bard's Tale II is, perhaps, the easiest of the trilogy to master.

The current installment, Bard's Tale III: Thief of Fate (Software Gallery, January 1989), finds the town of Skara Brae in ruins, leaving you to quest through seven different dimensions in search of a character with the ominous name of The Evil One.

Each successive Bard's Tale improved the speed, graphics and quality of play. Happily for the pencil-weary adventurer, BT III includes an automapping feature that helps you explore its mind-boggling 84 dungeon levels. In addition, you'll find over 500 monsters to contend with. For variety, there are now 13 different character classes, including seven types of spellcasters. Fortunately, although it's not necessary, characters created in earlier games can be ported over to the newest releases.

While the Bard's Tale series has neither the interaction nor plot sophistication of the Ultima line, it does a remarkably good job of creating a world that will keep most gamers hopping for hundreds of hours.

I Was a Teenage Ultima

Released last year, Deathlord is a wolf dressed in Ultima clothing. Here we see Ultima trademarks like overhead views, complete with spot animation, line-of-sight barriers and other types of graphics. This is not to say, however, that the game is unoriginal or without merit.

Deathlord is an immense program that will take the average gamer approximately 150 to 200 hours to complete. It's also the first fantasy role-playing game to be set in the Orient.

Table 1. Adventuring hints and tips.

Bard's Tale I:

—The name of the one god is Tarjan. You'll need to know this in order to enter the catacombs.
—If your party dies, you'll be returned to the guild, without gold. Always make a copy of your character disk after each important session. If you get killed, you can create a temporary character who can use your back-up party's pooled gold to resurrect most of the deceased party. If you're not worried about losing the experience points, you can simply load the party from the back-up disk. Immediately resave the rescued party!
—Keep your spare-character slot filled with a powerful, non-playing character, especially before a big battle. Monsters will tend to attack them first.

Bard's Tale II:

—The six gods are Lanitar, Alliria, Ferofist, Werra, Sceadu and Valarian.
—Stuck at the double door in the beginner's dungeon? Just sing a "Watchwood" melody.
—Although it's expensive, the dream spell can be used to gain entry to any dungeon.

Bard's Tale III:

—You'll need a wineskin (or something similar) to get past Valarian's tower.

Ultima IV:

—You'll find a special horn on an island off the tip of Spiritwood. Search the island well.
—Need a sextant? Ask for item "d" in Vesper.
—When questioned about the "Pure Axiom" in the Chamber of the Codex, answer with the translated eight letters you saw in each of the eight shrines. The key is in the order in which you used the stones to enter the Codex!
—What to do with the horn when you find it? Blow it often near the Shrine of Humility.

Ultima V:

—Lord British will appear in your dreams. This is the only way you'll be promoted from one level to another.
—You'll find the keep of the Shadowlords in a rocky place south of Minoc.
—Looking for a grapple? Talk to a lord in Empath Abbey.
—If all else fails, you can use a cannon to blow up the door of this famous lord's apartment.
—The only way enabling you to fly is found in this man's bedroom. Is it shag or medium pile?

Deathlord:

—The Guards are long on memory. Once you are on their bad side, don't bother coming back to town.
—Need a sea ticket? Kill a sailor.
—Sleep on a full stomach.

Table 2. Manufacturers' addresses.

Wizardry series
Sir-Tech Software
PO Box 245
Ogdensburg, NY 13669

Ultima series
Origin
136-B Harvey Rd.
Londonderry, NH 03053

Bard's Tale series; Deathlord
Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404

Pool of Radiance; Hillsfar; Heroes of the Lance; Dungeon Masters Assistant
Strategic Simulations, Inc.
1046 N. Rengstorff Ave.
Mountain View, CA 94043

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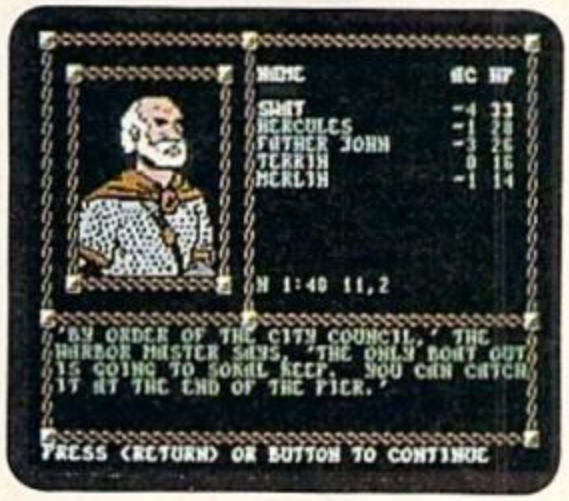
You have been called upon by the emperor of Kodan to vanquish the source of evil that has brought death and destruction upon the land. This entails traveling the large continent, exploring a vast array of dungeons, towns and pyramids, and interacting with the game's various entities.

The program is certainly ambitious, but it falls somewhat short of where the Ultima and Bard's Tale series have gone. It doesn't offer the strategic battles of Ultima, nor does it provide for the crisp, detailed monster graphics of Bard's Tale.

While Deathlord is interesting and notable in some ways, I found the Oriental flavor to be more window dressing than an active plot ingredient. I feel that players coming off Ultima or Bard's Tale campaigns may step away from Deathlord feeling like they've just eaten Chinese food: full, but still hungry.

The Circle Is Complete

In 1988, Strategic Simulations entered a licensing agreement to produce computer FRP games under the AD&D


NAME
AC HP
SWIFT -4 33
HERCULES -1 28
FATHER JOHN -3 26
TERRIN 0 16
MERLIN -1 14
N 1:40 11,2
'BY ORDER OF THE CITY COUNCIL,' THE HARBOR MASTER SAYS, 'THE ONLY BOAT OUT IS GOING TO SOKAL KEEP. YOU CAN CATCH IT AT THE END OF THE PIER.'
PRESS (RETURN) OR BUTTON TO CONTINUE

Pool of Radiance.

logo, resulting in the titles Pool of Radiance, Hillsfar, Heroes of the Lance and Dungeon Masters Assistant.

Pool of Radiance and Hillsfar are FRP games that follow the lines of true AD&D. We can once again generate players with strength, intelligence, wisdom, dexterity, constitution and charisma, while rediscovering ability scores, multiple classes, honest-to-goodness alignments, saving throws and spell books.

Both games place you in a three-dimensional world filled with monsters and bad guys. While they may not have quite the sophistication or plot twists of an Ultima or a Bard's Tale, they'll feel like a comfortable pair of old jeans to die-hard AD&D players.

Conclusion

Where the FRP genre will finally end up is anyone's guess, because there are a number of other games that have made a major impact on the industry: Wizard's Crown, Questron, Legacy of the Ancients, Phantasie and Times of Lore, to name a few. The appeal of these games has also spawned a new class of role-playing game involving science fiction. Wasteland, Mars Saga and Project Firestart are examples of this new genre.

I could go on and on, and still leave much unsaid about the fascinating realm of fantasy role-playing games. ■

John Ryan, this month's games guru, is one of RUN*'s steadily prolific contributing editors.*

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RUN's Checksum

TYPE IN *RUN*'s CHECKSUM, which serves for both the C-64 and for the C-128 in either 40- or 80-Column mode, and save it to disk before running. When typing in a program from *RUN*, first load and run *RUN*'s Checksum. The screen will display a SYS number that deactivates and reactivates the Checksum. Always disable *RUN*'s Checksum before attempting to run another program. Note: You can abbreviate Basic keywords; spaces affect the checksum only when within quotes; and the order of characters affects the checksum.

With this new version, when you press return after typing in a program line, a one-, two-, or three-digit number from 0 to 255 appears in the home position. If this number matches the checksum value in the program listing, the line is correct. If the number that appears *doesn't* match the checksum value, compare the line with the magazine listing to find your error. Then move the cursor back up to the line and make your corrections. Now, after you press return, the correct checksum value should appear. Continue entering the listing until all the lines have been correctly typed. Then deactivate *RUN*'s Checksum, using the SYS number. Save the finished program.

All the graphics and control characters in the listings in *RUN* have been translated into understandable key combinations. They are the instructions you see inside the curly braces. For example, {SHIFT L} means you hold down the shift key while you press the L key. You do *not* type in the curly braces. What appears on the screen will look quite different from what is designated inside the braces. Here are some more examples:

{22 SPACEs}—press the space bar 22 times
{SHIFT CLR}—hold down the shift key and press the clr-home key
{2 CRSR DNs}—press the cursor-down key twice
{CTRL 1}—hold down the control key and press the 1 key
{COMD T}—hold down the Commodore logo key and press the T key
{FUNCT 1}—press the F1 key
{5 LB.s}—press the British pound key (*not* #) five times R

Listing 1. *RUN*'s Checksum program. This program is available on *RUN*'s BBS for users to download.

```
10 REM RUN'S CHECKSUM 64/128 - BOB KODADEK
20 MO=128:SA=3328:IF PEEK(40960)THEN MO=64:SA=4
   9152
30 FOR I=0TO169:READB:CK=CK+B:POKE SA+I,B:NEXT
40 IFCK<>20651 THENPRINT"DATA ERROR!":END
50 POKESA+110,240:POKESA+111,38:POKESA+140,234
60 PRINTCHR$(147)STR$(MO)" RUN CHECKSUM":PRINT
70 PRINT"TO TOGGLE ON OR OFF, SYS"SA:IF MO=128
   THEN 100
80 POKESA+13,124:POKESA+15,165:POKESA+25,124:PO
   KESA+26,165
90 POKESA+39,20:POKESA+41,21:POKESA+123,205:POK
   ESA+124,189
100 POKESA+4,INT(SA/256):SYS SA:NEW
110 DATA 120,162,24,160,13,173,4,3,201,24,208,4
    ,162,13,160,67,142,4,3,140
120 DATA 5,3,88,96,32,13,67,152,72,169,0,141,0,
    255,133,176,133,180,166,22
130 DATA 164,23,134,167,132,168,170,189,0,2,240
    ,58,201,48,144,7,201,58,176
140 DATA 3,232,208,240,189,0,2,240,42,201,32,20
    8,4,164,180,240,31,201,34
150 DATA 208,6,165,180,73,1,133,180,230,176,164
    ,176,165,167,24,125,0,2,133
160 DATA 167,165,168,105,0,133,168,136,208,239,
    232,208,209,169,42,32,210
170 DATA 255,165,167,69,168,170,169,0,32,50,142
    ,169,32,32,210,255,32,210
180 DATA 255,169,13,32,210,255,104,168,96,104,1
    70,24,32,240,255,104,168
190 DATA 96,56,32,240,255,138,72,152,72,24,162,
    0,160,0,32,240,255,169
200 DATA 42,208,198
```

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GEOWATCH

These subroutines make it possible to increase the color memory of geoProgrammer's bitmap screen.

By JAMES E. HOSEK

WITH ITS BUILT-IN GRAPHICS Kernal, text, I/O and math routines, geoProgrammer provides an excellent environment for C-64 programmers. Through its use of menus, icons and interrupt-driven processes within structured programming, it greatly simplifies the task of putting together complex and interactive applications.

However, geoProgrammer lacks routines that manage the color memory for the bitmap screen. In Color Me GEOS, I've designed four routines that let you manipulate the screen's color by filling, saving or restoring specified rectangular areas of color memory.

How Color Memory Works

Think of the screen as being made up of 8×8 blocks of pixels. Commonly referred to as a card, each block consists of eight bytes of bitmap data, and each card is assigned one byte of color data.

Color memory is mapped out in exactly the same way as text screen memory—25 rows of 40 color bytes each. In fact, in Bitmap mode, the VIC-II video chip uses the text screen as color memory.

Each byte of color memory is divided into two segments, called nybbles, of four bits each. The top four bits—the first nybble—specify the foreground, or pixel color, for that card. The bottom four bits constituting the second nybble create the card's background color. Together, they specify the color card for that particular 8×8 bitmap card.

For example, to make white dots on a purple background, the color card would have the value 1*16+4=20 ($14). Each of the 1000 8×8 sections of bitmap screen can take on one of 256 different color combinations.

ScreenColor

The first routine in Color Me GEOS is called ScreenColor, which lets you initialize the screen, border and mouse colors to the values specified in pseudoregister r0.

ScreenColor takes advantage of routines within geoProgrammer to change the border and mouse colors, and it accesses ColorBox (see below) to alter the screen color.

ColorBox

ColorBox lets you work in a rectangular area that must fall within card boundaries. Because icons must be specified as rectangular areas, you can highlight different icons with different foreground colors. ColorBox also distinguishes the menu bar with a different set of colors.

When used in conjunction with SaveColor and RestoreColor (see below), you can create colorful dialog boxes. Since the standard dialog box icons are 6×2 cards in size, you can highlight the different icons within a dialog box.

SaveColor

The SaveColor routine is similar to ColorBox, except that no color card is specified. SaveColor saves the color memory within a rectangular area in a compacted form. The compacted data consists of two bytes, the first a color-card value, and the second a counter value.

Color memory in the area specified is scanned from right to left and top to bottom. Every time the color-card value changes, a new set of data is saved to the data area.

If you have two calls to SaveColor without restoring the first block of data with RestoreColor, the first set of data is lost.

RestoreColor

The final routine, RestoreColor, complements SaveColor. It restores the previously saved data to a rectangular area. The values for top, left, width and height of this area should be the same as for the previous SaveColor routine; if they are not, the results may be unpredictable.

SaveColor and RestoreColor can be used with dialog boxes, the boundaries of which should fall on the 8×8 card boundaries in order to coincide with color memory.

To use my routines in your own geoProgammer applications, place a copy of Listing 1 on your work disk and include it in your link file. Listing 2 demonstrates saves for use with ColorBox and SaveColor. Listing 3 is the link file for the demo program.

Now, go ahead and enjoy your newly colored world of GEOS! R►

James Hosek is a veterinarian by profession and a veteran C-64 programmer by avocation.

Table 1. Reference sources.

The Official GEOS Programmer's Reference Guide, Bantam Books, 1987.

geoProgrammer User's Manual by Matthew G. Loveless, Berkeley Softworks, 1987.

Mapping the Commodore 64 by Sheldon Leemon, Compute! Books, 1984.

Commodore 64 Programmer's Reference Guide, Commodore Business Machines, Inc., 1983.

RUN it right: **C-64; GEOS; geoProgrammer**

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Listing 1. Color subroutines for GEOS.

```
.if     Pass1                   ;include symbol and macro files
.noeqin
.include geosSym
.include geosMac
.eqin
.endif

ScreenColor:                    ; r0L - FOREGROUND * 16 + BACKGROUND
        jsr     InitForIO       ; r0H - MOUSE * 16 + BORDER
        MoveB   r0H, extclr
        lsr     a
        lsr     a
        lsr     a
        lsr     a
        sta     mob0clr
        jsr     DoneWithIO
        lda     r0L
        jsr     i_ColorBox
        .byte   0, 0, 40, 25
        rts

ColorRam:                       ; Subroutine to calculate color
                                ;  memory location of top
                                ; left corner of specified box.
        lda     #0
        sta     r0H
        lda     r1H             ; get top
        asl     a               ; x 2
        asl     a               ; x 4
        adc     r1H             ; x 5
        asl     a               ; x 10
        asl     a
        rol     r0H             ; x 20
        asl     a
        rol     r0H             ; x 40
        adc     r1L             ; + left
        bcc     1000$
        inc     r0H
1000$:  sta     r3L
        lda     r0H
        clc
        adc     #$8C
        sta     r3H
        MoveB   r2H, r4H
        rts

i_ColorBox:                     ; Inline Routines
        ldy     #$00            ; .a - FOREGROUND * 16 + BACKGROUND
        .byte   $2C             ;      (for i_ColorBox only)
                                ; Inline Pass (data appears immediately after the jsr):
i_SaveColor:                    ;       .byte   left column of box (0 - 39)
        ldy     #$40            ;       .byte   top row of box (0 - 24)
        .byte   $2C             ;       .byte   width of box in cards (1 - [40-left])
                                ;       .byte   height of box in cards (1 - [25-top])
i_RestoreColor:
        ldy     #$80
        sty     r0H
                                ; Retrieve and Store Inline Data
        sta     r0L             ;    color byte
        PopW    r3              ; get return address (data after jsr)
        ldy     #1
        lda     (r3), y         ;    left
        sta     r1L
        iny
        lda     (r3), y         ;    top
        sta     r1H
        iny
        lda     (r3), y         ;    width
        sta     r2L
        iny
        lda     (r3), y         ;    height
        sta     r2H
        tya
        clc
        adc     r3L             ; calculate new return address
        sta     r3L
        bcc     1000$
        inc     r3H
1000$:  PushW   r3              ; push new address onto stack
        bit     r0H             ; branch to appropiate routine
        bmi     RestoreColor
        bvs     SaveColor

ColorBox:                       ; Fill rectangle with specified color card
                                ;       r0L - color byte
                                ;       r1L - left              r1H - top
                                ;       r2L - width             r2H - height

        jsr     ColorRam        ; Calculate memory location of Color RAM
1000$:  lda     r0L             ; Fill rectangle with specified color card
        ldy     r2L
        dey
2000$:  sta     (r3), y
        dey
        bpl     2000$
        dec     r4H
        beq     ColorOut
        lda     #40
        clc
        adc     r3L
        sta     r3L
        bcc     1000$
        inc     r3H
        bne     1000$
ColorOut: rts

RestoreColor:                   ; Fill rectangle with data from last SaveColor
                                ;       r1L - left      r1H - top
                                ;       r2L - width     r2H - height
        jsr     ColorRam        ; Calculate memory location of Color RAM
        ldx     #$FF            ; Set pointer to color data
        stx     r0H
        jsr     GetColorData    ; Get first set of color data
                                ; (a-color card, x - number of bytes)
1000$:  ldy     r2L             ; Restore Color Data
        dey
2000$:  sta     (r3), y
        dex
        cpx     #255            ; Check if ready for next set of data
        bne     3000$
        jsr     GetColorData    ; Get next set of color data
3000$:  dey
        bpl     2000$
        dec     r4H
        beq     RestoreOut
        pha
        lda     #40
        clc
        adc     r3L
        sta     r3L
        pla
        bcc     1000$
        inc     r3H
        bne     1000$
RestoreOut: rts

GetColorData:                   ; Retrieve 2 bytes of screen color data
        sty     r4L
        ldy     r0H
        iny
        lda     $7F40, y        ; byte 1 - color card
        iny
        ldx     $7F40, y        ; byte 2 - number of bytes for this card
        sty     r0H
        ldy     r4L
        rts

SaveColor:                      ; Scan and store color memory in compacted form
                                ;       r1L - left              r1H - top
                                ;       r2L - width             r2H - height

        jsr     ColorRam        ; Calculate memory location of Color RAM
        ldx     #$FF            ; Set pointer to color data
        stx     r0H
1000$:  ldy     r2L             ; Scan color memory
        dey
        lda     (r3), y
        sta     r0L
2000$:  lda     (r3), y
        cmp     r0L             ; if the same as previous color card,
                                ; increase counter value
        beq     3000$
        pha
        lda     r0L             ; if not the same, save data
        jsr     SaveData
        pla
        sta     r0L             ; and start counting new color card
3000$:  inx
        cpx     #$FF            ; if 255 bytes, then save data and
                                ; start new counter
        bne     4000$
        jsr     SaveData
4000$:  dey
        bpl     2000$
        dec     r4H
        beq     SaveData
        lda     #40
        clc
```

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```
            adc     r3L
            sta     r3L
            bcc     5000$
            inc     r3H
5000$:      ldy     r2L
            dey
            bpl     2000$

SaveData:                           ; Saves two bytes of screen color data
            sty     r4L
            ldy     r0H
            iny
            sta     $7F40, y        ; byte 1 - color card
            iny
            pha
            txa
            sta     $7F40, y        ; byte 2 - number of bytes
            pla
            sty     r0H
            ldy     r4L
            ldx     #$FF
            rts
```

Listing 2. Demo program.

```
.if         Pass1                   ;include symbol and macro files
.noeqin
.include    geosSym
.include    geosMac
.eqin
.endif

FileStart:  LoadB   r0L, DKGREY * 16 + LTGREY       ; Screen Colors
            LoadB   r0H, BLUE * 16 + LTGREY         ; Mouse and Border Color
            jsr     ScreenColor                     ; Set Colors
            LoadW   r0, ColorDialog
            jsr     DoDlgBox            ; Go do Dialog Box
            jsr     i_RestoreColor      ; Restore Color under Dialog Box
            .byte   7, 7, 24, 14        ; ( inline data )
            jmp     EnterDeskTop        ; Return to DeskTop

ColorDialog:                            ; Dialog Box Definition Table
            .byte   SET_DB_POS | 1      ; Set Position
            .byte   56, 167
            .word   56, 247
            .byte   DB_USR_ROUT         ; Call routine to set up color memory
            .word   SetUpDB
            .byte   OK                  ; OK icon
            .byte   2, 88
            .byte   CANCEL              ; CANCEL icon
            .byte   16, 88
            .byte   DBTXTSTR            ; Text for Dialog Box
            .byte   4, 18
            .word   DBinfo1
            .byte   DBTXTSTR
            .byte   4, 22
            .word   DBinfo2
            .byte   DBTXTSTR
            .byte   4, 34
            .word   DBinfo3
            .byte   DBTXTSTR
            .byte   4, 46
            .word   DBinfo4
            .byte   DBTXTSTR
            .byte   4, 58
            .word   DBinfo5
            .byte   DBTXTSTR
            .byte   4, 70
            .word   DBinfo6
            .byte   DBTXTSTR
            .byte   88, 94
            .word   Pick
            .byte   DBTXTSTR
            .byte   88, 103
            .word   One
            .byte   0                   ; End of Table

                                        ; TEXT DATA
DBinfo1:    .byte   "This is an example of how color can be", 0
DBinfo2:    .byte   "used to spice up Dialog Boxes in GEOS.", 0
DBinfo3:    .byte   "Four special Color subroutines allow you", 0
DBinfo4:    .byte   "to change the border and mouse colors,", 0
DBinfo5:    .byte   "and the background and pixel color of", 0
DBinfo6:    .byte   "any part or all of the screen.", 0
Pick:       .byte   "PICK", 0
One:        .byte   "ONE", 0

SetUpDB:
            jsr     i_SaveColor             ; Save Color Memory under
                                            ; Dialog Box
            .byte   7, 7, 24, 14            ; ( inline data )
            LoadB   r0L, WHITE * 16 + PURPLE ; Screen Color for Dialog Box
            jsr     ColorBox                ; Call ColorBox using parameters
                                            ; from  previous call to
                                            ; i_SaveColor
            lda     #LTGREEN * 16 + GREEN   ; Set color for OK Icon
            jsr     i_ColorBox
            .byte   9, 18, 6, 2
            lda     #LTRED * 16 + RED       ; Set color for CANCEL Icon
            jsr     i_ColorBox
            .byte   23, 18, 6, 2
            lda     #YELLOW * 16 + PURPLE   ; Set color for text "PICK ONE"
            jsr     i_ColorBox
            .byte   15, 18, 8, 2
            rts
```

Listing 3. Link file program.

```
.output     Color_Demo
.seq
.psect      $8400
DEMO.rel
COLOR.rel
```


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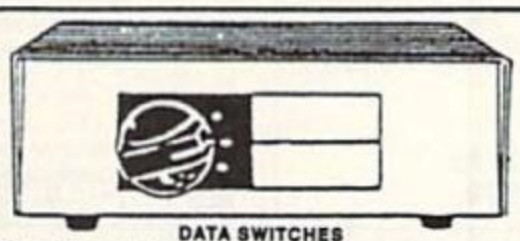

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TYPE-IN TROUBLES?

Troubleshooting tips for entering listings.

YOU HAVE TYPED IN A *RUN* PROGRAM and are having some problems getting it to run. After a while, you feel like calling for help, but since we're not next door, it's expensive to call us. But we can share our experiences with you. Having heard from many users over the years about their difficulties with typing in listings, we've identified a few recurring problems that plague many people but are easy to fix. So read on and see if your problem is one of these. If so, perhaps the answers will help you find and correct the difficulty.

- You get an Out of Data in Line xxx message. This means that a program line was reading from Data statements and reached the end of the data before it was done reading. There are two possible problems.

One might be with the line that reads the data, usually a For . . . Next loop. Make sure you have the proper values for the loop, because if the listing has a loop of 0 to 150 and you've typed 0 to 160, you'll get the "Out of Data" message. If the loop is correct, then the problem lies in the Data statements themselves. One possibility is that you omitted a whole line of data. That's easy enough to find and correct. More likely, you may have skipped one or more individual data items or typed in a period instead of a comma, which causes two data values to be read as one number. Check your typing carefully against the listing.

- You get an Illegal Quantity Error in Line xxx. That means that you've read a number from a Data statement and tried to Poke it into a memory address. The error occurs because the number is larger than 255 (the largest value a memory address can contain), which means that somewhere in your Data statements you've made an error by typing in a number larger than 255. Again, this is easy to check for and correct. Just look in your Data statements for a number larger than 255. You might have added an extra digit, or perhaps you ran two numbers together (23456 instead of 234,56).
- You get a Syntax Error in Line xxx. This could be almost anything. What it tells you is that there is something wrong in the indicated line. Usually you've misspelled a Basic keyword or omitted some required character. List the line and examine it carefully.
- You get an Error in Data message. This occurs in programs that add up all the data as read, and, when finished, compares that sum with what it should be if all the data were typed in correctly. If it isn't the same, it means an error somewhere in typing the Data statements. Go back and check the data carefully, correct the mistake(s), save the new version and try again.

Finally, we urge everyone who intends to type in one of our listings to use *RUN*'s Checksum program, which is printed in each issue. This nifty little program will help you avoid every mistake we mentioned above, except that it won't detect the omission of a line. ■

—LOU WALLACE

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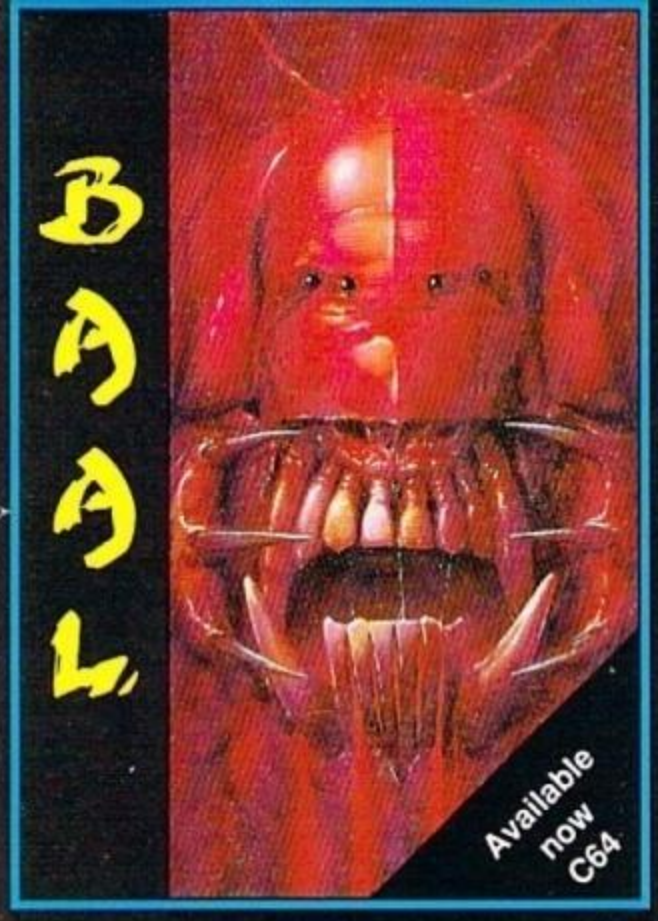

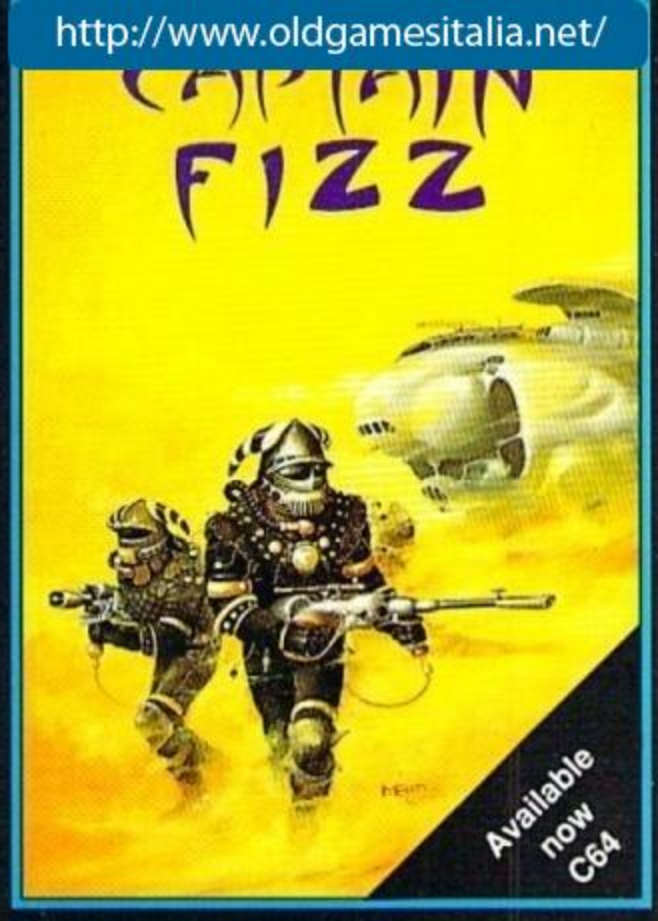

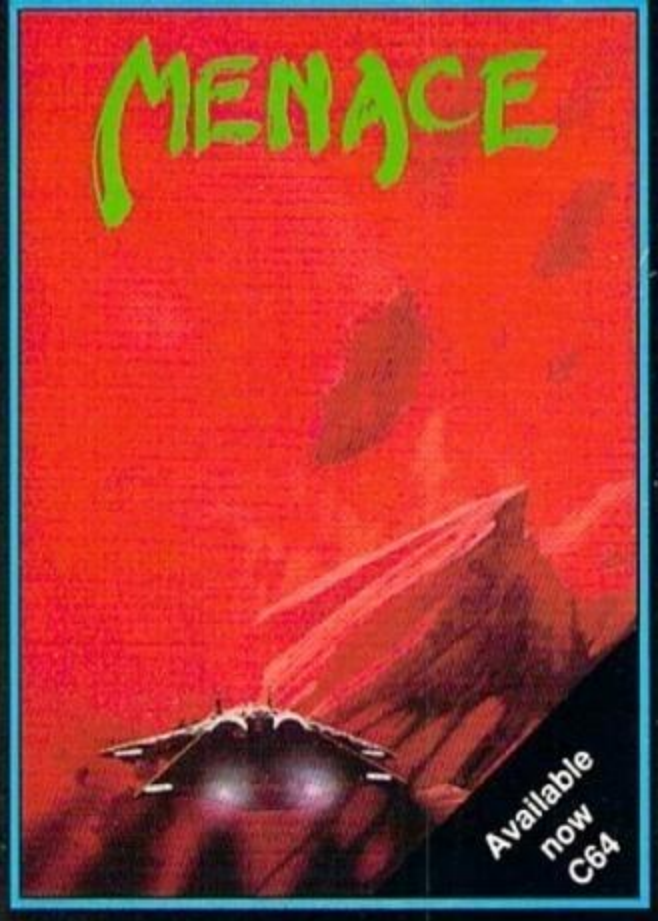

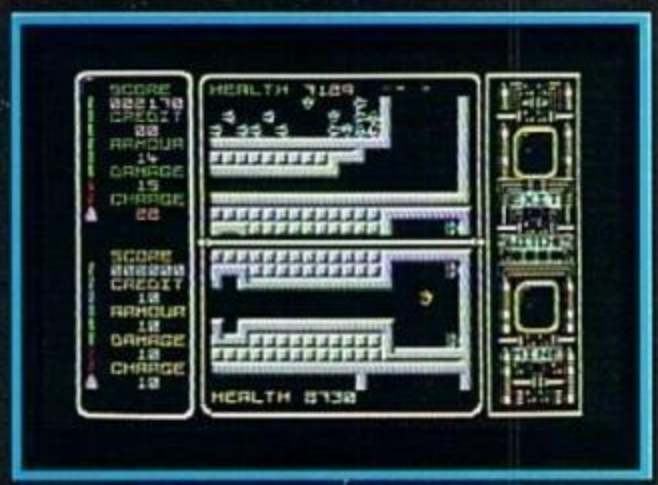

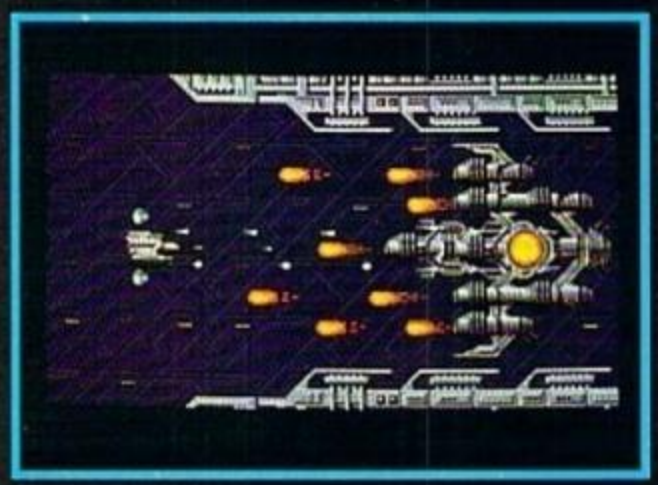

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